

The Effect of Green Workplace Design on Employee Engagement and Productivity in the Jordanian Public Sector

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Received: 2 Oct. 2023, Revised: 31 Dec. 2023, Accepted: 26 Jan. 2024.

Published online: 1 Mar. 2024.

Abstract: In this study we explored the influence of Green Workplace Design (GWD) on employee engagement and productivity within the Jordanian public sector. Through surveying 360 participants working in designated GWD buildings, we utilized the Employee Productivity Scale, Employee Engagement Scale, and Green Workplace Design Scale. Our findings indicate a significant positive impact of GWD on both employee engagement (35.2% increase) and productivity (45.5% increase). Interestingly, while heightened employee engagement initially correlated with decreased productivity (19.7% decrease), GWD emerged as a mediating factor, fostering focused and versatile spaces for engagement. This underscores the value of creating work environments that optimize employee well-being, fostering collaboration, knowledge-sharing, and innovation. Importantly, in regions like Jordan with limited light supply and inadequately designed public sector buildings, the implementation of GWD could revolutionize organizational performance, strengthening workplace relationships and communication.

Keywords: Sustainability, Green Buildings, Jordan Public Sector, Employee Engagement, Employee Productivity.

1 Introduction

Eco-friendly office layouts have been associated with heightened productivity and enhanced management-worker connection [1-2]. Prioritizing worker comfort over a perceived authenticity is more conducive to establishing a favorable office environment [3], potentially leading to improved interpersonal interactions, attitudes, and ultimately organizational performance [4-5-6].

Global demand for green buildings is rising, presenting alluring prospects for the construction industry. [7] projects a 47% surge in global green building projects by 2024. Green buildings are aimed at reducing energy costs and greenhouse gas emissions through the integration of nature and nature inspired solutions [8]. The green building accreditation movement started in the 1990s in the UK with the Building Research Establishment Environmental Assessment Method (BREEAM), then followed by the Leadership in Environmental and Energy Design (LEED) [9-10]. LEED accreditation is widely adopted as the global benchmark for high-performing green buildings. This accreditation became critical in the advent of technology and environmental awareness, necessitating the need to have more ecologically friendly design that minimise negative environmental impact [11].

Biophilic design's affirmative impact on inhabitants' cognitive and emotional functioning is supported by literature [12], with green buildings integrating elements to enhance occupant focus and alleviate stress. Recently, there has been a transition from emphasizing environmental benefits and operational expenses, the focus is shifting towards human-centred strategies in green building design. Cultivating conditions that foster employee engagement is pivotal for harnessing their full dedication and energy within the workplace [13]. However, the understanding of performance and human aspects in green buildings remains limited.

Employee engagement denotes the effective adoption of environmental sustainability, yielding enhanced performance and reduced operational costs [14-15]. Environments promoting health and sustainability tend to enhance worker productivity. Uplifted employee happiness and satisfaction correlate with organizational initiatives [16]. Dissemination of knowledge regarding green features stimulates heightened attention to the work environment [17]. Workplace contentment significantly influences employee job satisfaction and commitment to the organization [18-19-60], while comfort and user satisfaction impact worker morale within green buildings [20].

The adoption of green building standards has not enjoyed such rapid growth in the Middle east countries. According to [21], despite the rapid growth of cities in the region, there have been significant barriers largely due to lack of public understanding of the essence of green building designs, lack of knowledge of the benefits of such designs, investor

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concerns due to the high costs of the technologies, issues around profitability and most importantly, shortage of skilled people who are able to design and construct such buildings to international standards. Where the buildings do exist, there has been a lack of research on how occupying such buildings, especially in the public sector, has impacted on productivity and organisational performance. The public sector has been said to benefit the most in terms of the opportunities provided through improved green designs, light, air quality and ventilation, layout [22-23-24]; therefore, there should not be any major differences in terms of the public sector in the Middle East and that in the rest of the world [25].

2 Literature review

2.1 Attributes of a green workplace design

The last two decades have seen fast development in the global green building movement, where construction has been guided by the focus on minimising environmental impact. For example, in 2008, the UK government declared that all new public buildings and commercial enterprises must achieve "zero carbon" status by 2018 [26]. Thus, environmentally friendly and sustainable designs are becoming obligatory, especially in the public sector. Several certification standards were also introduced in the early 1990s as a way to standardise measures of "greenness" and to create a benchmark by which building quality can be measured and compared [22]. The British Establishment and Environmental Assessment method (BREEAM) was the first such accreditation to be introduced in the 1990s [10], followed by the USA Leadership in Energy and Environmental Design (LEED) in [10], then followed the GreenStar Australia in 2003 and GreenStar South Africa in 2008, and the National Australian Built Environment Rating System (NABERS) in Australia [22]. Enhanced indoor air quality (IAQ) strategies can also qualify for tax incentives linked to health factors (e.g., advanced filtration, CO₂ monitoring) [27]. Another certification initiative that emphasizes health is the Living Building Challenge (LBC), introduced in 2006 by the International Living Future Institute. Within the LBC's holistic framework, various "petals" encompass elements like place, water, energy, health and happiness, materials, equity, and beauty. A notable contribution of the LBC is its "Red List," prohibiting the use of hazardous substances, representing a pivotal advancement in the green building movement [28]. While the environmental and human advantages of internal green building features are progressively acknowledged, the aesthetic benefits of these constructions are better established.

Green buildings have been described as having specific attributes that integrate natural environmental factors such as airflow and natural light, which limit extensive energy usage [29]. They are also typical including natural factors such as having trees, indoor plants, and views, allowing sufficient natural light through having large windows [30]. Green Workplace Design (GWD) takes into account all of these attributes. Several distinct attributes of GWD have been identified, including Indoor Air Quality (IAQ) and Ventilation, Office Layout, Lighting and Daylighting, Thermal Comfort, Biophilia and Views, Aesthetics, Noise and Acoustics, and Location and Amenities [31-32]. Improved IAQ has been linked to more focused employees, reflecting in improved task efficiency such as faster typing rates [33-34]. In addition, research has shown that improved and increased access to natural daylight, settings with trees and natural indoor plants as well as window views positively impact on employee psychological wellbeing and contribute to stress reduction rates [30-35]. According to [36], the naturalistic features of buildings are so important to employee wellbeing that they can be considered to be employee benefits at work. Due to all of these highlighted benefits, green buildings are thought to be healthier and promote wellbeing and productivity [36].

2.2 Impact on employee productivity

Productivity can be defined as the output per unit input into a process [37]. The number of studies demonstrating a correlation between environmentally friendly office features and increased productivity is growing [38]. Studies show that buildings that are deemed unhealthy have a negative impact on employee health, and the impact can translate to reduced productivity. Factors that contribute to low environmental quality within a building, such as low indoor environmental quality (IEQ) can cause the development of severe symptoms associated with "sick building syndrome", where people have low health indicators because of poor environmental quality of the workplace, and when employees experience lots of discomfort, they tend to report sick more often and are absent from work more often, which severely impacts productivity [39].

High-performance buildings, often referred to as "healthy" buildings, have been shown to reduce absenteeism, enhance tenant productivity [38]. Green buildings integrate improvements that can improve air intake and general ventilation, moisture regulation, regulation on construction materials that improve health and limit toxin buildup, energy efficiency through the use of natural light and airflow structures [22]. In a cross-sectional study of over 11 000 workers, researchers found that workers experienced increased perceived productivity and demonstrated reduced absenteeism and illness signs when they were in green buildings and had some control on their ambient environment [40-41]. A similar finding was reported for public sector workers in Thailand, who reported more focused workdays and therefore

more productivity when they had personalised and controlled ventilation where they could regulate ambient temperature in their breathing range [39]. The fresh air allowed for clarity of mind and better focus on tasks. In another studies, employee’s productivity increased by 16% when they moved into a building with green design principles [42], while in another study increased productivity was recorded when employees experienced positive feelings about their workplace [35] and when ambient environmental temperatures were good and fostered high levels of employee comfort [39]. Therefore, for employees, it is essential to maximise the quality of the ambient environment and to improve comfort levels of employees [22]. Ensuring that the thermal environment (temperature, humidity, air quality and lighting) is stable, allowing personal control over these variables can increase efficiency and productivity [43]. As is described in Figure 1, employee productivity is directly linked to employee health, which is impacted by both physical and behavioral factors.

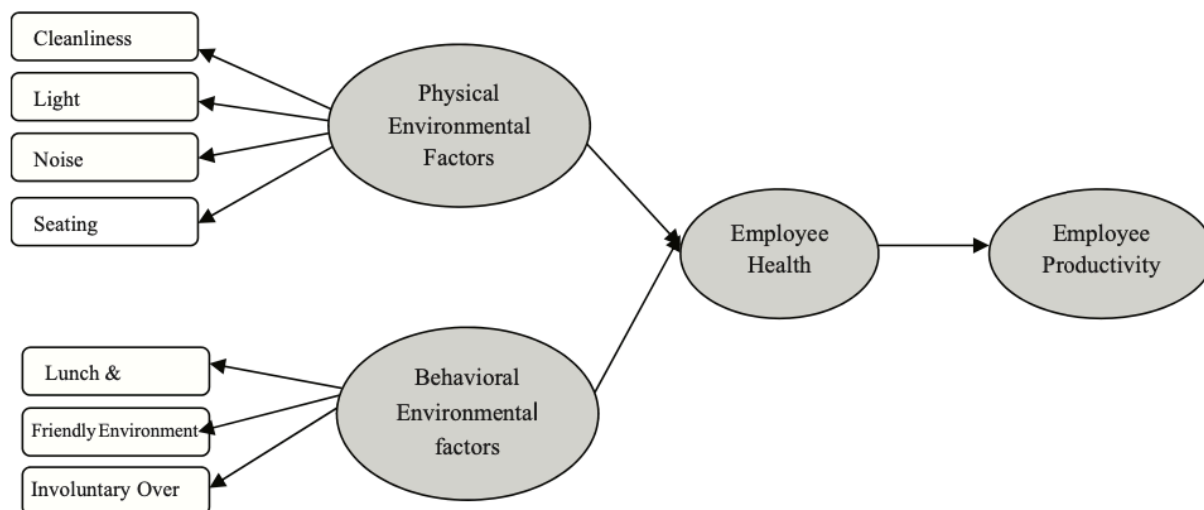


Fig. 1: Relationship between workplace environment on employee productivity

Source: [4]

Green Office Buildings (GBFIs) that have implemented green practices and standards achieve up to 16% higher productivity compared to those that have not [44]. There has not been a large number of studies that have rigorously examined how green building affect productivity [22]; and although there is growing evidence that green buildings improve ambient environments and influence employee productivity and wellbeing, it is unclear in which measures of productivity this is reflected. For example, [22] argues that the measures of productivity are not standardised, in this way the results from the various are not comparable. For example, some studies measure productivity as reduced absenteeism, building use satisfaction levels and task efficiency [37].

The workplace design within green buildings can foster productivity through improved employee engagement and interaction [31-32]. In an effort to save costs, construction design for offices emphasises open-floor plans, especially in public sector spaces. These spaces are crucial and aimed at fostering collaboration within these shared spaces; however, often they can be disruptive spaces if not set-up correctly [45]. In green building design, such spaces can be enhanced positively to foster better collaboration and engagement between employees [21].

2.3 Impact on employee engagement

Green buildings, with their amenities such as outdoor views, indoor vegetation, landscape artwork, and architectural elements inspired by nature, often provide resources that facilitate worker relaxation and refocusing. A positive workplace environment can do wonders for an organization by boosting morale, employee engagement, and productivity. [46] research indicates that over half of the businesses adopting green workplace design experience increased employee engagement and productivity. In this new paradigm, the workplace culture resembles that of a supportive family, promoting a sense of comfort and ease. According to [47], green workplace design accounts for more than 40% of the positive shift in workplace mood. A vibrant workspace empowers employees, fosters warmth and affection, and gives organizations a competitive edge. Many employees willingly invest extra time and effort into their work to demonstrate their dedication to their employer and their satisfaction with the work environment. It is reasonable to expect employees to reciprocate the effort when employers go the extra mile to ensure their staff’s well-being [48]. Therefore, if we desire a more productive workforce, offices need to become more engaging.

Research by [49] indicates that a green workplace layout can significantly increase employee productivity. People generally exhibit higher tolerance levels when inside environmentally friendly structures, which translates to greater productivity. Improved lighting models and thematic elements in green buildings have been shown to enhance workers' morale [50]. Moreover, the workplace should serve as an ideal representation of the organization, fostering a positive employee attitude and enhancing teamwork and collaboration (UNEP, 2011). Employees prefer an environment that emphasizes personal relationships, encourages open discussions, and avoids excessive formality. Decorations, signage, and artworks can create the desired atmosphere and facilitate employee engagement. By attracting employees' attention and creating a sense of openness and camaraderie, these elements help establish an environment where colleagues not only work together but also become supportive friends [51].

In today's world, a productive work environment necessitates a positive social context. The Asia-Pacific region has embraced green workplace design, as people in this region value environmental friendliness. Leading platforms recognize the significance of a positive work environment in terms of employee engagement and output. [52] suggest that a dynamic and environmentally friendly workplace motivates people to work harder and stay engaged. Modern office layouts that prioritize environmental consciousness symbolize the public's increasing appreciation for their role in preserving the planet.

2.4 Study aims and hypotheses

The aim of this study was to ascertain the impact of Green Workplace Design on employee productivity and engagement in the Jordanian Public Sector. The objectives were as follows:

- Determine the effect of GWD on employee productivity
- Determine the effect of GWD on employee engagement
- Ascertain whether employee engagement impacts on employee productivity and whether GWD can moderate for this effect

The author posited the following hypothesis:

H1: Green workplace design has significant and positive impact on employee productivity

H2: Green workplace design has significant and positive impact on employees' engagement

H3: Employee engagement has significant and positive impact on employees' productivity

H4: Green workplace design leads to better employee productivity with a moderating effect of employee engagement

3 Methodologies

There was no published data about how many workers or people worked in public sector green workplaces in Jordan, hence convenience sampling (CST) was used to select the respondents. CST is a nonprobability sampling method in which study samples are drawn from the study population based on the criteria of convenience, proximity, availability, and desire to participate [53]. Questionnaires were provided to sample participants who were working in buildings with Green Design.

An extensive literature evaluation was conducted first to identify relevant literature and to identify relevant theoretical frameworks for this study. A quantitative approach to the research was used to achieve the study's goals. To collect data for this study, researchers surveyed the population (Jordanian public sector organisations) using a closed-ended questionnaire.

3.1 Green Workplace Design Scale

The measures of Green Building Workplace Design were selected from the study defining green building [54]. GWD scale measurement has 11 items broken into three parts A- Energy, B- Indoor environment and C- Material waste.

3.2 Employee Engagement Scale

To measure employee engagement, the constructs established in the study by [55] who designed an empirical model to study employee engagement. The construct of the scale measurement was validated through testing on 296 participants. The final items for the scale measurement were 8 and categorised into three variables A- Emotional Drivers, B- Behavioural Engagement and C- Cognitive Drivers. For each of the items, the measurement was based on a Likert-scale ranging from 1 to 5, with 5 being high and 1 being low.

3.3 Employee Productivity Scale

Items from the recently validated constructs for measuring employee productivity [56-57] have been used for the present study. The author selected the constructs measures for Task efficiency and Task interdependence:

3.3.1 Task efficiency:

- I have a high work performance
- I accomplish tasks quickly and efficiently
- I set a high standard of task accomplishment
- I achieve a high standard of task accomplishment
- I always beat our team targets

3.3.2 Task interdependence:

- I have to obtain information and advice from my colleagues to complete my work
- I depend on my colleagues for the completion of my work
- I have to work closely with my colleagues to do my work properly
- In order to complete their work, my colleagues have to obtain information and advice from me.”

The questions related to employee engagement and productivity were scored on a scale of 1 to 5.

3.4 Data analysis

Descriptive statistics were conducted in SPSS to determine the demographic profile of the participants and to summarise the responses of the questionnaire. Reliability and Validity of questionnaire constructs was assessed using Cronbach’s Alpha. To test the effect of Green workplace on employee engagement and productivity; and to assess the effect of employee engagement on productivity, a Linear Regression analysis with Correlation was used. A generalised linear model was applied to assess the effects of workplace design on employee productivity and its moderating impact on employee engagement. All data analyses were conducted in SPSS.

4 Results

4.1 Reliability and Validity

The Cronbach’s Alpha measure of reliability and validity of construct show that the items in the scale measurements show construct reliability and validity, all with Cronbach’s Alpha values above 0.50 (Table 1). For the 5-item scale for Employee engagement, the Cronbach’s Alpha score is above that found in the model designed by [55]. Similarly, for the measurement of Employee Productivity, the construct measurements scored Cronbach’s Alpha values lower than that found by [56] which was 0.87. This could be that there were more participants in the study measure. The reliability and validity of construct found for this variable (0.75, Table 1) is still high.

Table 1: Reliability and validity statics for questionnaire constructs

Variable	Cronbach's Alpha	N of Items
Green workplace design	.761	11
Employee engagement	.785	8
Employee productivity	.749	9

4.2 Demographic profile of participants

Three hundred and 60 (360) randomly selected inhabitants from Jordan's public sector participated in the survey to obtain the data for the research. The demographic profile revealed that most respondents were female (70.8%), with a relatively young age range of 20-30 (44.2%). In addition, most participants had an annual salary of between \$5,000 and \$8,000 (64.2%).

Table 2: Demographic profile of participants in the study

		Number of respondents	%
Gender	Male	105	29.2
	Female	255	70.8
Age	20-30	159	44.2

	31-40	130	36.1
	41-50	53	14.7
	Above 50	18	5.0
Income	Below 5k	64	17.8
	5k-8k	231	64.2
	8k-15k	47	13.0
	Above 15k	18	5.0

The descriptive statistics showed that the mean value of Employee Engagement was 3.4649 on a scale of 5, while the mean value of Employee Productivity was 2.8515 on the same scale. These results suggest that the participants had moderate to high levels of employee engagement and relatively low to moderate levels of employee productivity.

4.3 Influence of Green Workplace on employee engagement and productivity

A multiple linear regression analysis was conducted to ascertain the effect of GWD on employee engagement and employee productivity. Correlation analysis showed that both employee engagement ($r = 0.342$ $P < 0.01$) and employee productivity ($r = 0.236$ $P < 0.01$) were strongly positively associated with GWD (Table 3). Employee engagement showed a moderate and significant negative association with employee productivity ($r = -0.128$ $P < 0.05$) (Table 3), suggesting that increased employee engagement may reduce employee productivity.

Table 3: Pearson correlation analysis assessing the relationship between GWD, employee engagement and employee productivity.

Variables		Green_wp	Emp_eng	Emp_Pro
Green_wp	Pearson Correlation	1	.342**	.236**
	Sig. (2-tailed)		.000	.000
Emp_eng	Pearson Correlation	.342**	1	-.128*
	Sig. (2-tailed)	.000		.015
Emp_Pro	Pearson Correlation	.236**	-.128*	1
	Sig. (2-tailed)	.000	.015	
**. Correlation is significant at the 0.01 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

Regarding the influence of GWD on employee productivity, the model was significant ($F_{(2, 359)} = 20.981$, $P < 0.001$), explaining 10% of the variation in employee productivity (Adjusted $r^2 = 0.10$). When considered alone, GWD increased employee productivity significantly by 35.2% ($\beta = 0.352$ $P < 0.001$), while employee engagement reduced employee productivity significantly by 19.7% ($\beta = 0.197$ $P < 0.001$), Table 4.

Table 4: Regression coefficients table showing the effect of GWD and Employee engagement on Employee productivity.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.361	.209		11.317	.000
	Green_wp	.352	.059	.317	5.950	.000
	Emp_eng	-.197	.044	-.236	-4.439	.000
a. Dependent Variable: Emp_Pro						

4.4 Influence of GWD on employee engagement

A linear regression was used to ascertain the effect of GWD on employee engagement. The model was significant ($F_{(1, 359)} = 47.29$ $P < 0.001$), explaining 11.4% of the variance in employee engagement (Adjusted $r^2 = 0.114$). GWD increased employee engagement by 45.5% ($\beta = 0.455$ $P < 0.001$), Table 5.

Table 5: Regression coefficient table showing the effect of GWD on employee engagement

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.947	.226		8.615	.000
	Green_wp	.455	.066	.342	6.877	.000
a. Dependent Variable: Emp_eng						

5 Discussions

The purpose of this study was to investigate the impact of green workplace design on employee productivity and employee engagement, while considering the mediating role of GWD on the interaction of employee engagement and employee productivity. Hypothesis 1 and 2, which posited that GWD has a positive effect on employee engagement and employee productivity was supported. GWD was strongly positively associated with employee engagement, and increased employee engagement by 45.5%. Employee productivity was moderately positively influenced by GWD, which increased employee productivity by 35.2%. Hypothesis 3, which posited that employee engagement has a significant positive effect on employee productivity was not supported. Employee engagement was negatively associated with employee productivity, and reduced employee productivity by 19.7%. Thus, increased employee engagement may lead to a compromised workplace in that employees may become less productive. However, this would depend on the measures of productivity, for example, task interdependency. Hypothesis 4, which posits that GWD leads to improved employee productivity while having a moderating effect on employee engagement. The findings suggest that there is a positive effect of GWD on minimizing the potential negative effect of employee engagement on employee productivity. Infrastructure elements within GWD may serve to create spaces for increased engagement but also space for focused engagement which may provide essential diversity in work and access to information and coworkers, which may result in increased quality and quantity of work outputs. has a mediating effect on employee engagement likely due to increased distractions. Researchers have argued for the importance of quality relationships in the workplace, as such, focused and varied opportunities for engagement provided by GWD may serve to strengthen employee relationships, improve knowledge sharing which ultimately increases productivity, job satisfaction and other factors [58].

In a contrasting result to this study, [59] found that green design offices did not have a significant positive effect on employee engagement and employee environmental perceptions. Similarly, [22] also found no significant effect of green building design on employee productivity in a South Africa cohort study. Employee engagement in this study was measured as job satisfaction, perceived productivity, and affective organisational commitment. [40] also found that employee satisfaction levels were lower in green design buildings, citing lower thermal comfort (green buildings perceived to be warmer) and lighting, which may have negatively impacted respondents. In these cases, the building specifications and layout may have contributed to the reduced quality of the attributes associated with green building designs, resulting in the negative experiences as perceived by the respondent in the studies.

In a study by [49], a comparative assessment of participants pre and post move into a green building resulted in significant health and productivity gains. As per the study findings, participants who moved into the green building experienced improved health and lowered respiratory allergies which the authors translated to additional work hours gained. The authors found that reduced respiratory allergies could increase productivity through adding 1.75 additional work hours; stress reduction can increase productivity through adding 2.2 additional work hours; ultimately resulting in approximately 38.98 work hours per year additional for those employees in green buildings.

The public sector worldwide is typically associated with low productivity and poor service delivery. Given the outcomes of the studies reported here, improvement in building design and environment changes that serve to improve employee wellness and productivity could change the way public sector services are viewed. Public sector workers, who often interact with a larger volume of customers and have a responsibility to provide quality services. Therefore, the workplace plays a crucial role in their performance. Green workplace design in the public sector can create a private-sector-like atmosphere, as highlighted by [34], since many government workplaces are typically monotonous, with low lighting and old dilapidated buildings, which can be demoralizing for employees [22]. Thus, governments and public sector should invest in appropriate infrastructure development in order to support employee health and wellbeing, which will translate in tangible outputs in terms of efficiency and productivity which will yield significant organisational output and performance.

6 Conclusions and Recommendations

This study found a strong association between GWD, employee productivity and employee engagement. The extensive review of the literature indicated that there is a significant link between green building designs and employee productivity due to the health impacts of such green spaces on workers. Features such as improved indoor air quality, natural lighting, access to green spaces, eco-friendly materials, and biophilic design elements contribute to reduced stress levels, improved mental health, increased physical activity, and higher overall well-being among employees. Organizations investing in sustainable workplace design can expect to see benefits not only in terms of employee health and well-being but also in productivity, job satisfaction, reduced absenteeism and overall organizational performance due to more focus at work. The results are increased task efficiency and outputs. Therefore, companies and public sector organisations can reap the benefits of investing in being green. Given the difficulty of retaining workers in the public

sector, a more environmentally conscious corporate culture could help address this issue.

As this is the first study to assess this in Jordan, the results cannot be widely generalised. There were some contrasting results found in other research works which indicate that there could be some limitations in terms of the assessments of the measures of productivity. Therefore, more work is needed in this area in terms of comparisons pre and post move into green buildings, comparison between private and public sectors, and also in home settings. Before these results can be generalized, more study comparing green and conventional workplaces in Jordan is needed.

Conflicts of Interest Statement

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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