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The Role of Strategically Designed Work Environments for the Wellbeing and Performance of Generation Z Employees

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ABSTRACT

Office workers spend a substantial proportion of their time within workplace environments, underscoring the importance of workplace design in shaping employee outcomes. This study examines the extent to which workplace design features influence the wellbeing and productivity of Generation Z employees. Data were collected through an online questionnaire and analysed using descriptive statistics, reliability and validity assessments, multiple linear regression, and one-way ANOVA in SPSS. The results identify biophilic design as the most significant predictor of workplace wellbeing and productivity. Although Generation Z is frequently assumed to demonstrate stronger workplace design preferences, no statistical evidence was found to support this assumption. The findings suggest that organisations should adopt employee-centred workplace strategies and prioritise the integration of natural elements to optimise employee wellbeing, productivity, and workplace performance.

1. Introduction

Over fifty percent of the world population occupies an office environment for an average of half the day. The constant exposure substantially affects the well-being and performance of staff members. Several international organisations have advocated for enhanced sustainable work practices and investments in employee well-being to promote a more “human-centered” workplace [1]. Companies are progressively emphasising employee well-being and productivity to distinguish themselves from competitors [2]. Some studies [3-6] emphasised the significance of the working environment in influencing productivity and organisational success. These advantages include a reduction in complaints and absenteeism, with an enhancement in productivity [7]; an improvement in indoor perception [8]; and support in realising corporate strategy [9]. Ninety percent of employees and almost all executives recognise the significance of workplace design characteristics on productivity [10]. Both the company and the employee will experience the repercussions of poor

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working conditions. Conversely, when workspaces are effectively planned and implemented, they facilitate employee focus and productivity.

It is receiving increasing attention and is anticipated to constitute 30% of the workforce by 2030 [11]. Generation Z is distinguished by their focus on professions, strong work ethic, and pragmatic perspective on life, making it the most educated generation to date. Concurrently, their perspectives and behaviours in the workplace are significantly influenced by the rapid advancement of new technologies and the increasing complexity of their work environment [12]. Workplaces designed for previous generations might not accomplish to meet the requirements of contemporary workers owing to changes in work patterns, technology, and communication. Kumar *et al.,* [13] assert that Generation Z prioritises an individual's whole well-being, including mental, emotional, financial, and social factors. Baik and Nayak [14] assert that the generational gap has significantly widened owing to the fast progression of cultural and technological transformations. Consequently, individuals from diverse generations exhibit more acceptance of each other's lifestyles and possess varying perspectives. Meeting the aspirations of Generation Z is becoming challenging for several enterprises and older generations because to the rapid pace of societal change and disruption [14]. To enhance workplace efficacy, it is essential to understand individual characteristics and preferences while fostering a supportive environment that accommodates Generation Z demands.

1.1 Productivity

The physical environment of the workplace significantly influences workers' efficiency. Hua *et al.,* [15] assert that job completion is facilitated by well-planned service areas, dedicated zones for specific functions, and well-equipped workstations. Ergonomic workplace accommodations and optimal furniture and equipment arrangement enhance communication patterns, hence improving operational efficiency and fostering sustained long-term production [16]. Elmahadi *et al.,* [17] indicate a significant transition in workplace design towards open floor patterns that provide enhanced supervision and expedited communication. Conversely, several studies indicate that workers exhibit less productivity in workspaces characterised by expansive open floor designs, reduced personal space, and increased auditory and visual disruptions [18,19].

Incorporating plants into work environments enhances productivity and creativity, as shown by several studies. Studies indicate that the presence of plants and external views in the workplace may enhance stress management, improve morale, and increase employee retention [20]. Numerous studies indicate that exposure to natural elements, in contrast to urban vistas, enhances self-reported productivity, work satisfaction, and sustained attention [21]. The Attention Restoration Theory (ART) and the Stress Recovery Theory (SRT) suggest that interaction with natural surroundings may replenish our attentional resources, with short intervals of concentrated outside observation acting as temporary restorative experiences.

In expansive areas, vegetation serves as a natural barrier that obstructs light and sound, facilitating concentration [22]. Nonetheless, the benefits of these therapies vary based on the specific task and the individual's preferences [23]. Given that no two workplaces are alike, biophilic interventions must be tailored to the unique requirements of the employees, rather than being included as "green" enhancements.

Privacy, autonomy, and user control are three dimensions through which socio-spatial factors influence productivity. Roessler and Mokrosinska [24] assert that sufficient privacy enhances work concentration and regulates social interactions. Research on open floor layouts in the workplace presents contradictory findings. Open floor patterns facilitate ad hoc cooperation and information sharing [25]. Kim and De Dear [26] indicate a danger of diminished privacy and satisfaction, which may be very distracting for knowledge-based occupations that need focused attention. Effective

spatial configurations may facilitate high-performing open-plan organisations by accommodating roles that need frequent interaction while also offering options for privacy, such as quiet rooms and diverse environments [27].

Personalisation is a prevalent method for individuals to express their territoriality in the workplace, and studies indicate that it enhances performance and productivity. Wells [28] discovered that it improves enjoyment, motivation, and retention, while simultaneously reinforcing identity expression. Brunia and Hartjes-Gosselink [29] and Greene and Myerson [30] assert that personalisation often occurs at the individual workplace via desk modification. This delineates responsibilities, fosters a sense of purpose and security, and alleviates the adverse effects of insufficient privacy.

1.2 Wellbeing

Increased positive affect, energy, and job satisfaction are consistently associated with healthy office environments [31]. The subsequent significant element in assessing workplace wellbeing is environmental comfort model conducted by Vischer [32]. An agreeable workplace attains three levels of comfort. Three categories of comfort are included: physical (e.g., cleanliness, accessibility, and security), functional (e.g., the efficacy of the space in fulfilling its intended purpose), and psychological (e.g., the extent to which it meets demands for identity, belonging, and a sense of control). This theory posits that when workplaces address comfort expectations, it results in enhanced satisfaction and wellbeing.

Sparrow [33] indicates that design features enhancing contact with colleagues and offering enough storage capacity increase the ability to monitor job activities. Consequently, it demonstrates that a well-designed layout may enhance productivity. Office designs impact employees' emotional well-being by influencing their interpersonal ties with colleagues, extending beyond the utilitarian requirements. Cole *et al.,* [34] discovered that teams exhibited enhanced communication, generated innovative ideas, and had more comfort in interpersonal interactions when the workplace included an open floor layout. Enhancing team cohesion and promoting social interactions may provide a feeling of psychological comfort. Therefore, it is essential to maintain design with functional areas, controlled density, and specified proximities. Moreover, furniture that is both utilitarian and visually appealing may significantly contribute to establishing a serene and efficient workspace [35,36]

Employees have reduced physical stress in environments that replicate natural settings [37]. Researchers have shown that the presence of plants in the office may positively influence indoor air quality [38], blood pressure, and cortisol levels [39], hence enhancing overall workplace comfort. Many authors believe that spending time in nature is therapeutic [40-42]. It may enhance mood and overall psychological well-being, which is the rationale for the recommendation. Hartig *et al.,* [43] elucidate that concentrated attention may be rejuvenated by repeated shifts of gaze towards natural stimuli, resulting in micro-restorative episodes.

Open office designs heightened distractions, diminished privacy, induced sensations of overcrowding, and resulted in adverse auditory and visual impacts [26,44-46]. Prolonged exposure to these pressures may accumulate mental and physical burdens, requiring more coping techniques and ultimately jeopardising workers' health [47]. Researchers have shown that when employees possess more autonomy in their workplace, they are more inclined to effectively use its configurable features, hence enhancing morale and reducing stress [48]. Wells [28] posits that personalising workstations with significant items may enhance workers' comfort and security, hence aiding them in managing workplace challenges.

1.3 Generational Differences in Workplace Design

Age is a critical factor in assessing the preferences and differences among occupants. The influx of Generation Z workers is instigating a significant transformation in employment demographics. The expectations and attributes of Generation Z employees remain mostly uncharted. This study encompasses the multi-generational workforce, including Baby Boomers, Generation X, Generation Y, and Generation Z. Generation Z, those born between 1997 and 2012 [49], is the latest cohort of workers and is notably the first generation to have extensive exposure to digital technology from a young age. Research contrasting Gen Z's workplace preferences with those of other generations has led scholars to investigate Gen Z's distinct requirements in professional environments [50].

Although Gen Z is regarded as digital natives, increasing urbanisation, anxiety, and limited opportunities to engage with nature may be undermining their respect for and connection to the natural environment [51]. Subsequent study post-pandemic reveals that younger persons exhibit heightened concern for environmental health and pollution, with a more profound connection to nature [52]. Global workforce research indicates that more than 25% of Gen Z are receptive to engaging with firms and organisations that prioritise social and environmental responsibility, aligning with their commitment to sustainable projects [53]. A study revealed that younger employees exhibit heightened self-awareness regarding the significance of their physical and mental well-being, favouring work environments that foster holistic wellness, including those featuring biophilic design elements such as vegetation, natural illumination, and vistas of nature [54]. Drewery *et al.,* [55] assert that biophilic design aligns with Generation Z's sustainability objectives. Empirical study [56] indicates that biophilic aspects positively influence individuals' well-being, job satisfaction, mental health, and workplace productivity.

Kruse and Tata [57] assert that Generation Z emphasises open and reciprocal communication, emphasising the significance of collaboration, autonomy, and accountability in the workplace, in contrast to preceding generations that prioritise established routines. Some studies indicate that millennials desire continuous, real-time communication and direct, interactive engagement in the workplace [58-60]. Transparency, efficiency, and interactive communication are essential components of their work environment. Organisations should maintain open communication channels and promote dialogue among workers; this will enhance the current generation's connection to the firm and its objective, so elevating morale, creativity, and commitment to purposeful work [61].

Saraiva and Nogueiro [62] assert that younger generations prefer workplaces that are modern, adaptable, and easily modified to accommodate various duties. Phone booths and quiet spaces are provided as required, alongside other multifunctional workstations, including touchdown spaces, enclosed rooms, and collaboration zones, suitable for both individual tasks and group projects. Moreover, Generation Z members exhibit a heightened need for flexibility and autonomy in their work environment, hence facilitating opportunities for office customisation. According to industry statistics, Gen Z had a greater preference for customisable workplaces (34% compared to 28%), whereas Gen Y shown a stronger inclination towards traditional office settings (45% against 28%). These findings align with the findings of Ozkan and Solmaz [63], indicating that Generation Z prioritises territoriality and personalisation above predetermined arrangements.

The majority of the current study has concentrated on millennials, while also exploring the multigenerational workforce as a whole. The needs of Generation Z have garnered little attention among the research community. Despite the extensive research on work intentions, there is a scarcity of thorough studies examining how to integrate these results into workplace design. This study aims to investigate Generation Z's perceptions of workplace design and to identify their office environment preferences in order to inform future workplace strategies tailored to their needs. To

address the issues identified in the preceding literature review, the following research questions and objectives were developed:

(1) To what extent do (a) the physical office environment, (b) biophilic design, and (c) socio-spatial features affect employee's perceptions of workplace design and, therefore, their productivity and well-being?

(2) In comparison to other generations, what significance do members of Generation Z attribute to elements of workplace design?

This research has three articulated objectives designed to address the aforementioned issues:

To investigate the correlation between workplace productivity and several elements of office design, such as biophilic design, socio-spatial attributes, and the physical office environment.

To analyse the impact of many elements of workplace design on employee well-being, including the physical office environment, biophilic design, and socio-spatial characteristics.

To ascertain the primary workplace amenities valued by workers of the millennial and Gen Z generations.

2. Methodology

The data collection approach used in this study is online questionnaires. The study primarily focused on voluntary response sampling by self-selection. Target individuals above 18 years old and relevant office experience. All individuals provided their permission to participate. The poll link was disseminated on Weibo and LinkedIn to engage a broad and diverse audience. The posts included a link to an anonymous poll along with comprehensive participation instructions.

2.1 Procedure

The questionnaire was developed and disseminated by Qualtrics. A variety of technologies are accessible on the site to ensure the protection of user data. Providing clear and concise responses to multiple-choice enquiries may be difficult. To minimise misunderstandings, the study used concise, closed-ended questions with ordered options. The enquiries were articulated in a clear and impartial manner. The targeted receivers were those whose native language is Mandarin Chinese. Participants may choose their preferred language from the English and Mandarin versions of the survey.

This research used five-point scales in the questionnaire design. A prevalent method for assessing individuals' thoughts is using a Likert scale, which offers several options for responding to enquiries or making statements [63]. Participants may indicate their degree of agreement on a scale ranging from "Strongly Disagree" to "Strongly Agree."

A pilot study involving three volunteers was conducted prior to the formal distribution of the questionnaire. This preliminary testing enabled an initial evaluation of participants' perceptions, facilitated the identification of potential issues, and assessed the overall effectiveness of the survey instrument [64]. Feedback obtained from the pilot test improved the clarity and relevance of the questionnaire items, thereby enhancing the instrument's internal validity. In response to participants' feedback that the original 14-item wellbeing scale was excessively lengthy and repetitive, the measure was revised and reduced to a condensed 7-item scale. This refined version was subsequently adopted to assess key dimensions of wellbeing, improving the overall efficiency and usability of the questionnaire design.

2.2 Measurements

The 31-item questionnaire aims to investigate the correlation between two dependent variables—productivity and wellbeing—and the primary independent variable—workplace design elements, including the physical office environment, biophilic designs, and socio-spatial attributes. The 27 parts of Part 1 include all pertinent aspects necessary for addressing the research questions. Part 2 has four

questions designed to collect demographic information. The content validity of this study was ensured by choosing or adjusting all variables from published and validated literature [64]. This study used four adapted items from Elsbach and Pratt [65] to evaluate the physical workplace environment. These elements pertain to layout, available space, aesthetic appeal, and functionality. Research by Hähn *et al.,* [66] used four questions to assess "contact with nature" and "office plantation" within the context of biophilic architecture. The six questions assessing socio-spatial dimensions including workplace comfort, autonomy, and privacy. An "attention check" question was included to verify the authenticity of the data; responses that failed this assessment were excluded from the research.

The dependent variable, workplace productivity, was assessed via a five-item scale including 'teamwork', 'assignment completion', and 'creativity and innovation.' This survey derives its framework for employee wellbeing from the Warwick-Edinburgh Mental Wellbeing Scale (SWEMWBS), a succinct adaptation of the comprehensive version of seven positively phrased items that are appropriate for survey research [67]. Feedback from pilot testing indicated duplication and excessive length in the original 14-item WEMWBS; hence, the SWEMWBS was implemented as a replacement. The SWEMWBS has significant psychometric validity in various groups and maintains theoretical integrity despite its abbreviated format [68].

To comprehend the features of the collected sample, four demographic questions were posed: age, gender, education level, and employment field. Dillman *et al.,* [69] discovered that positioning demographic enquiries towards the conclusion of the questionnaire enhanced response rates, as participants were less prone to be unsettled by potentially challenging topics. To guarantee that all participants are above 18 years of age, we will only accept responses from those born between 1998 and 2010, despite Generation Z often being defined as those born between 1996 and 2010 for ethical considerations.

2.3 Data Analysis

SPSS was used to analyse the data in this paper. To begin, we summed up the demographic profile and important variable means using descriptive statistics. Subsequently, we used Cronbach's alpha with the KMO and Bartlett's tests to assess validity and reliability. We used Pearson correlation analysis to further investigate the relationships among the variables. We used linear regression models to examine hypotheses on the relationships among ergonomics, productivity, and workplace satisfaction. Subsequently, one-way analysis of variance (ANOVA) was used to examine generational differences in workplace design elements.

2.4 Ethic Consideration

To guarantee compliance with ethical standards, all participants received a concise summary of the study's objectives and confidentiality assurances before to commencing the survey [70]. The ethics committee at University College London granted consent for this study. The data will be securely and anonymously retained, as specified in the consent form. We explicitly informed participants that their participation in the survey was completely voluntary and that they would not face any repercussions for withdrawing. At the end, participants will receive the researcher's contact details should participants have any questions about the experiment.

3. Results

3.1 Descriptive Results

Of the 210 questionnaire responses, 197 were valid for statistical analysis. Thirteen responses were classified as invalid: three failed attention assessments, and ten had incomplete data. An impressive 93.8% of participants completed the poll. Table 1 displays the participant demographics.

A total of 153 females and 43 men participated in the poll; one individual opted not to identify their gender. The predominant age group is 18–27 years, with 75.1% of the total, followed by the 28–43 years age bracket at 19.8%. The number of responses in the other age ranges is somewhat lower. Almost fifty percent of survey participants had a master's degree or above, while almost fifty percent of those with a bachelor's degree achieved that qualification. The sample of individuals employed in sales and retail trade constitutes 29.9 percent, while those from the administrative and support services sector account for 17.3 percent. The third tier comprises arts and design, accounting for 11.68% in IT/software and 10.15% in healthcare/medical.

Table 1
Demographic Information

Variable		Frequency (N)	Percentage (%)
Age	18 – 27 (Gen Z)	148	75.127
	28 - 43 (Millennials)	39	19.797
	44 - 59 (Gen X)	4	2.030
	> 59(Baby boomers)	6	3.046
Gender	Male	43	21.827
	Female	153	77.665
	Prefer not to say	1	0.508
Education	High school and below	6	3.046
	Apprenticeship or Diploma	4	2.030
	Bachelor's Degree	85	43.147
	Master's degree and above	102	51.777
Occupational classification	IT / Software	20	10.152
	Healthcare / Medical	20	10.152
	Sales / Retail Trade	59	29.949
	Finance / Insurance	8	4.061
	Marketing / Advertising/ Media	12	6.091
	Administrative / Support Services	34	17.259
	Education / Academia	6	3.046
	Arts / Design	23	11.675
	Other (please specify)	15	7.614

The descriptive statistics encapsulate the characteristics and distribution of each variable, including the minimum, maximum, mean, and standard deviation of workers' responses, as shown in Table 2 of the questionnaire data.

Table 2
Variables statistics

Variables	Variable type	Min	Max	Mean	Standard deviation
Physical Office Environment	Independent	1.000	4.750	3.585	0.838
Biophilic Design	Independent	1.000	4.750	3.712	0.835
Socio-Spatial Features	Independent	1.000	4.833	3.443	0.819
Productivity	Dependent	1.000	4.800	3.758	0.811
Wellbeing	Dependent	1.000	4.857	3.666	0.801

At the neutral midpoint of the five-point Likert scale, where 1 signifies strong disagreement and 5 indicates strong agreement, all mean scores are situated between 3.443 and 3.758. All mean values above the neutral threshold of 3, indicating that respondents mostly agree with all components of the survey. The statements on workplace productivity received a strong consensus, shown by the highest mean score (M = 3.758). Biophilic design, with a mean score of 3.712, demonstrates a

profound appreciation for nature in the workplace, while socio-spatial factors received the lowest score of 3.443, indicating a less favourable perception

3.2 Reliability and Validity

This study used Cronbach's Alpha to assess the internal consistency of the measurement scales prior to testing the hypothesis. This coefficient signifies internal consistency by assessing the extent to which items within a scale are correlated. All components of a construct need properly measure the same attribute if the internal consistency coefficient is elevated [70]. A scale is deemed acceptable in principle if its coefficient exceeds 0.7. Consequently, Table 3 presents the findings of a reliability study conducted for each variable. With a reliability score of 0.749, each variable demonstrates that the items within each construct consistently evaluate the intended dimension. This supports the dataset's suitability for further research.

Table 3
Reliability analysis

Variables	Cronbach's alpha	Number of items
Physical office environment	0.794	4
Biophilic Design	0.749	4
Socio-Spatial Features	0.816	6
Productivity	0.834	5
Wellbeing	0.877	7

The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity are often used to assess construct validity, since related constructs are expected to exhibit high intercorrelation [71]. The KMO statistic was used to assess the extent to which the questionnaire items substantiate the proposed constructs in this study [72]. KMO levels approaching 1 indicate superior structural validity, whereas values below 0.5 are considered inadequate, and those beyond 0.70 are generally deemed acceptable in standard practice.

When the significance probability is less than 0.001, Bartlett's Test of Sphericity is considered very significant [73]. Refer to Table 4 for the study's results: KMO = 0.899, calculated chi-square = 2322.629, and 325 degrees of freedom, with a p-value less than 0.001. These results substantiate the questionnaire's rigorous design and affirm its strong structural validity.

Table 4
KMO and Bartlett's Test

KMO		0.899
Bartlett's Test of Sphericity	Approx. Chi-Square	2322.629
	df	325.000
	p value	0.000

Correlation analysis was conducted (Table 5) to examine the strength of the relationships between workplace design features, employee productivity, and wellbeing. The results revealed statistically significant positive correlations between all assessed workplace design dimensions and both outcome variables. Specifically, the physical office environment demonstrated moderate positive correlations with productivity (r = 0.453) and wellbeing (r = 0.503), indicating that improvements in physical workplace conditions are associated with higher levels of employee productivity and wellbeing. Biophilic design exhibited the strongest relationship with productivity among the examined predictors (r = 0.566), alongside a moderate positive correlation with wellbeing (r = 0.441). This suggests that the incorporation of nature-related workplace features may be particularly

beneficial for enhancing employee performance. Socio-spatial features also showed significant positive associations with both productivity (r = 0.418) and wellbeing (r = 0.393), although the magnitude of these relationships was comparatively weaker. Overall, these findings indicate that all examined workplace design features are positively and significantly associated with employee productivity and wellbeing, with biophilic design demonstrating the strongest relationship with productivity within the present dataset.

Table 5
Pearson Correlation analysis

Variables	Physical Office Environment	Biophilic Design	Socio-Spatial Features	Productivity	Wellbeing
Physical Office Environment	1	0.523*	0.426***	0.453***	0.503***
Biophilic Design	0.523***	1	0.377***	0.566***	0.441**
Socio-Spatial Features	0.426***	0.377***	1	0.418**	0.393**
Productivity	0.453***	0.566***	0.418**	1	0.469***
Wellbeing	0.503***	0.441**	0.393**	0.469***	1

Note: significance level (*p< 0.05; **p< 0.01; ***p< 0.001)

3.3 Workplace Design and Productivity

Table 6 show production equals 1.066 + 0.149 multiplied by the physical office environment, plus 0.399 multiplied by biophilic design, plus 0.196 multiplied by socio-spatial elements, as per the observable model. The independent variables in this model, namely workplace design, explain 38.5% of the variation in the dependent variable, productivity, as shown by an R-squared value of 0.385. The physical office environment has a positive and statistically significant correlation with productivity, shown by the regression coefficient (β = 0.149, p = 0.028). The standardised beta coefficient is below the significance threshold of 0.05.

Biophilic Design is a significant predictor of productivity, as shown by linear regression analysis (β = 0.399, p < 0.001). We may accept the null hypothesis since the p-value is statistically significant. Biophilic Design has a higher standardised beta coefficient (0.399) compared to the Physical Office Environment (0.149) and Socio-Spatial Features (0.196). This result highlights the much stronger impact of Biophilic Design inside the model, indicating that enhancements in Biophilic Design correlate with more substantial productivity gains than the other two categories.

The findings reveal that Socio-Spatial Features significantly influenced production (β = 0.196, p = 0.002). Consequently, given the p-value is below 0.05, indicating a positive and statistically significant correlation. The integration of these three elements of workplace architecture significantly enhances efficiency. The most significant influences are the physical office environment, socio-spatial characteristics, and biophilic design.

Table 6
Multiple Linear Regression Results Predicting Employee Productivity from Workplace Design Features

Dependent Variable	Independent Variables	β	SE	T test	P value	R^2	F value
Productivity	(Constant)	1.066	0.254	4.205	<0.001	0.385	40.309
	Physical Office Environment	0.149	0.067	2.221	0.028		
	Biophilic Design	0.399	0.066	6.082	<0.001		
	Socio-Spatial Features	0.196	0.063	3.112	0.002		

3.4 Workplace Design and Wellbeing

Table 7 presents the results for the dependent variable, wellbeing, with the independent variable, workplace design characteristics. The formula for the model is Wellness = 1.234 + 0.305 * Physical

Office Environment + 0.198 * Biophilic Design + 0.175 * Socio-Spatial Features. The design features of the workplace contribute to 32.2% of the variance in wellbeing, as shown by a R Squared value of 0.322.

Among the three criteria evaluated, the physical office environment had the strongest link with wellbeing (β = 0.305, p < 0.001). The p-value of less than 0.001 indicates that this positive association is statistically significant. Evidence indicates that enhancing office environments favourably affects employee well-being. The beta coefficient for physical environment enhancements is much greater than that for other workplace design elements, indicating a more pronounced impact on wellbeing. Wellness had a positive correlation with Biophilic Design (β = 0.198, p = 0.004). Given that 0.004 is inferior than 0.05, we may infer that natural features in the workplace enhance employee wellbeing. Workers seem to prioritise a workplace that is more ecologically sustainable and promotes their health and well-being. Wellbeing had a significant positive correlation with socio-spatial characteristics (β = 0.175, p = 0.008).

Consequently, it may be inferred that enhancing the socio-spatial dimensions of the workplace positively influences employee well-being. The three elements of workplace design significantly and positively influence workers' health and well-being. Among the three independent factors, Physical Office Environment, Biophilic Design, and Socio-Spatial Features are the most impactful.

Table 7
Multiple Linear Regression Results Predicting Employee Wellbeing from Workplace Design Features

Dependent Variable	Independent Variables	β	SE	T test	P value	R^2	F value
Wellbeing	(Constant)	1.234	0.263	4.693	<0.001	0.322	30.549
	Physical Office Environment	0.305	0.069	4.385	<0.001		
	Biophilic Design	0.198	0.068	2.912	0.004		
	Socio-Spatial Features	0.175	0.065	2.682	0.008		

3.5 ANOVA

Table 8 presents the findings examining whether significant differences exist in perceptions of three workplace design dimensions—biophilic design, socio-spatial features, and ergonomics—across four age cohorts. One-way analysis of variance (ANOVA) is a widely accepted statistical method for testing mean differences among three or more independent groups on a continuous dependent variable [26]. In the present study, ANOVA was employed to assess whether perceptions of workplace design features differed significantly across age groups. The analysis revealed no statistically significant differences among the four generational cohorts. Detailed results are presented in Table 9. The statistical study for Biophilic Design produced an F-value of 0.430 and a p-value of 0.732. F(3, 193) = 0.129, p = 0.943, represents the results for Socio-Spatial Features.

Table 8
One-Way ANOVA Results Comparing Workplace Design Perceptions Across Generational Cohorts

Dependent Variable	Age Generation Group (mean ± std)				Mean Square	Sum of Squares	df	F	P value
	Gen Z	Millennials	Gen X	Baby Boomers					
Biophilic Design	3.740 ± 0.834	3.667 ± 0.885	3.625 ± 1.010	3.375 ± 0.345	0.302	0.907	3	0.430	0.732
Socio-Spatial Features	3.448 ± 0.828	3.410 ± 0.822	3.667 ± 0.360	3.389 ± 0.929	0.066	0.198	3	0.129	0.943

No significant changes were seen across the generations in these situations, since all p-values above the 0.05 significance level. It may be concluded that there was no statistically significant

difference in the perceived influence of workplace design elements across generations. No post hoc multiple comparisons were conducted due to the absence of significant differences among the dependent variables across the age groups.

3.6 Workplace Design influence Productivity Discussion

The regression analysis demonstrated that all three workplace design dimensions—physical office environment, biophilic design, and socio-spatial features—exert significant positive effects on productivity.

Among these predictors, biophilic design showed the strongest contribution to productivity (β = 0.399, $p < 0.001$), indicating that greater incorporation of biophilic elements is associated with enhanced employee wellbeing and improved productivity outcomes. This finding aligns with prior studies suggesting that the integration of natural elements and nature-inspired features in workplace settings can enhance mood, reduce stress, and improve self-perceived productivity [74,75]. The result is further supported by Attention Restoration Theory (ART) [76] and Stress Recovery Theory (SRT) [77], both of which propose that exposure to natural environments helps restore cognitive resources and alleviate stress, thereby facilitating higher work performance.

Socio-spatial features also exhibited a significant positive association with productivity, representing the second strongest predictor in the model (β = 0.196, $p = 0.002$). This finding is consistent with Haynes [27], who argued that workplace environments fostering interpersonal interaction and collaboration can enhance productivity, particularly in tasks involving complexity and teamwork. However, the positive effects of socio-spatial configurations may be contingent upon the implementation of flexible working arrangements. Prior research has also highlighted that open-plan office layouts may generate adverse outcomes, including distraction and reduced privacy [26]. Therefore, workplace design should strategically promote social interaction and collaboration while maintaining adequate levels of personal privacy and acoustic comfort.

The physical office environment was also found to have a significant positive relationship with productivity (β = 0.149, $p = 0.028$). This result corroborates previous research indicating that well-designed, comfortable, and functional workplace environments can contribute positively to employee performance and productivity [15]. In particular, ergonomic furniture and appropriately designed office equipment may enhance operational efficiency by facilitating smoother workflows and reducing physical strain during work tasks [16].

3.7 Workplace Design influence Wellbeing Discussion

The regression analysis revealed that biophilic design exerted the strongest influence on employee wellbeing among the examined workplace design variables. This result is consistent with a substantial body of literature suggesting that stronger engagement with natural environments is associated with improved psychological wellbeing. Empirical evidence has also shown that the integration of plants within workplace settings can promote physiological health and enhance employees' daily vitality [37]. This outcome is further supported by ART and SRT, which suggest that exposure to natural stimuli facilitates cognitive restoration and physiological recovery. In this context, even brief interactions with natural elements or "micro-breaks" in restorative environments may contribute meaningfully to improved mental health.

Although slightly less influential than biophilic design, socio-spatial features also demonstrated a significant positive effect on employee wellbeing. This suggests that employees generally value workplace layouts that provide appropriate levels of autonomy, control, and spatial flexibility. Well-designed socio-spatial environments can satisfy both practical and psychological workplace needs. This finding aligns with environmental comfort model conducted by Vischer [32], which proposes

that workplace settings achieving a strong person–environment fit are more likely to generate higher levels of occupant satisfaction and wellbeing.

The physical office environment was likewise positively associated with wellbeing (p = 0.014), although its effect size was comparatively smaller. Prior research indicates that clear spatial organisation, appropriate workspace density, and multifunctional office zones can reduce physical strain and enhance workplace comfort [36]. One possible explanation for the relatively weaker effect of the physical office environment is employees' dissatisfaction with conventional open-plan office configurations. In practice, organisations may prioritise operational efficiency and cost reduction when designing workplace layouts [78], which can result in shared office environments that inadequately address users' daily functional and comfort requirements. Consequently, such design limitations may diminish employees' overall satisfaction with the physical workplace.

Overall, the results suggest a consistent ranking in the relative influence of workplace design dimensions on employee wellbeing and productivity, whereby biophilic design emerged as the most impactful factor, followed by socio-spatial features and the physical office environment. A plausible explanation is that employees may consider functional and ambient workplace conditions to constitute fundamental environmental expectations, while biophilic and socio-spatial attributes are perceived as value-added features that enhance the overall workplace experience.

Once fundamental workplace requirements are met, these higher-order environmental qualities may generate greater marginal gains in wellbeing and productivity. From a practical perspective, organisations may therefore derive the greatest benefit from prioritising biophilic design interventions, such as incorporating greenery, natural materials, and nature-inspired elements into workplace planning. Additionally, adapting workplace layouts to better align with occupant preferences may reduce stress and anxiety, strengthen employees' connection to the work environment, and ultimately promote greater job satisfaction, creativity, and productivity.

3.8 Generational Differences in Workplace Design

Generation Z would attach greater importance to workplace design features—specifically biophilic design and socio-spatial attributes—than other generational groups were not supported. Analysis of variance revealed no significant generational differences in the perceived importance of biophilic design, F (3, 193) = 0.430, p = 0.732, or socio-spatial features, F (3, 193) = 0.129, p = 0.943. As all significance values exceeded the 0.05 threshold, the results indicate that workplace design preferences did not vary meaningfully across generational cohorts, and Generation Z did not exhibit distinct preferences relative to older employees.

Descriptive statistics further corroborate this conclusion. Mean ratings for biophilic design remained largely uniform across all four generational groups, indicating minimal variation in attitudes toward nature-related workplace elements. This suggests that preferences for natural features, such as greenery and environmentally restorative design elements, are broadly shared among employees rather than being uniquely valued by younger generations.

Likewise, ratings for socio-spatial features showed little variation across age groups, indicating that employees from different generations assign similar importance to workplace environments that facilitate collaboration, interpersonal interaction, and spatial adaptability. Taken together, these findings imply that preferences for biophilic and socio-spatial workplace attributes may reflect common workforce expectations rather than generation-specific design priorities.

4. Conclusions

This study aimed to investigate the relationships between workplace design, employee wellbeing, and productivity, with particular attention to whether Generation Z employees place greater

importance on specific workplace design features. The findings demonstrate that workplace design significantly influences both employee wellbeing and productivity. Specifically, the regression analyses confirmed that physical office environment, biophilic design, and socio-spatial features all exert significant effects on employees' health, comfort, and work performance. Among these dimensions, biophilic design emerged as the strongest predictor of both wellbeing and productivity, suggesting that the integration of natural elements—such as indoor planting, natural materials, and nature-inspired furnishings—may substantially enhance employees' mood, wellbeing, and workplace effectiveness.

Using one-way ANOVA to assess whether Generation Z exhibited stronger preferences for biophilic and socio-spatial workplace design features compared with other age groups. The results revealed no statistically significant generational differences. Contrary to expectations, Generation Z did not demonstrate stronger preferences for biophilic or socio-spatial workplace attributes than older generations. Although younger employees are often assumed to place greater emphasis on collaboration, sustainability, and nature-oriented environments, the present findings suggest that preferences for these workplace design characteristics are broadly shared across generational cohorts.

These non-significant findings may partially reflect limitations in the study design, including sample size constraints and unequal representation across age groups. Nevertheless, the results provide valuable insights for the development of human-centred workplaces that support employee wellbeing and organisational performance. Overall, the study reinforces the proposition that workplace design contributes meaningfully to both employee wellbeing and productivity. The findings further indicate that workplace planning should adopt a holistic perspective, integrating physical, natural, and socio-spatial design dimensions to optimise the employee experience. Based on the limitations identified, several recommendations for future workplace design practice and research are proposed to support more effective workplace strategies in the building and business sectors.

4.1 Recommendations

Based on the findings of this study, future workplace design strategies should prioritise the integration of biophilic elements, the optimisation of open-plan office environments, and the implementation of user-centred design approaches.

First, biophilic design should be considered a strategic priority in workplace planning, given its demonstrated role in enhancing employee wellbeing and productivity [74,75]. Practical applications may include increasing indoor greenery, improving access to outdoor views, incorporating natural materials, and providing designated restorative spaces within the office environment.

Second, as open-plan offices remain the prevailing workplace model, future office design should focus on balancing opportunities for collaboration with the need for concentration. Although open-plan layouts can facilitate communication and teamwork, they are frequently associated with increased noise, distraction, and reduced privacy. To mitigate these issues, organisations should adopt both physical and behavioural interventions, such as installing acoustic treatments, creating designated quiet zones, and establishing workplace etiquette guidelines (e.g., limiting phone calls at shared desks). Such strategies may help reconcile collaborative and focused work requirements, thereby improving employee comfort and job satisfaction [27].

Finally, workplace design should recognise individual differences in environmental preferences and work styles. Prior research suggests that the same office environment may be perceived positively by some employees while generating stress or dissatisfaction for others. Accordingly, organisations are encouraged to adopt user-centred design processes by collecting employee

feedback through surveys, interviews, or participatory workshops prior to workplace redesign. Incorporating employee input and accommodating individual differences—such as personality traits, task requirements, and preferred work styles—may reduce person–environment mismatch and more effectively promote wellbeing and productivity.

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Conflicts of Interest
The authors declare no conflicts of interest.

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