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BIOPHILIC DESIGN: THE CASE FOR MALTA

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Abstract. The human need to relate with the natural environs is the foundation of biophilic design. Thus, such a design solution aims to establish a relation between the built environment and nature; it is fundamental to the well-being of the users of a given space. The objective of this study is to assess the relationship between employees' sensation of well-being and work place design in Malta, the smallest-in-size member state of the European Union, during the COVID-19 pandemic. Based on an online questionnaire circulated to all employees in the civil service and public authorities of Malta, the present working environs were studied and proposed design solutions were put forward. The data collected was analyzed by making use of the Statistical Package for the Social Sciences. Apertures were found to have substantial impact on the employees' mental well-being, health and mood; whilst reducing anxiety, they increase the perceived health ratings. Naturally lit and ventilated workspaces lead to higher productivity and less fatigue. The survey results provide a snapshot of the current work environs and provide data for improving their re-design along biophilic principles, an important consideration given that the island's workforce suffers from the highest rates of depression, anxiety and elevated stress levels within the European Union.

Keywords: *biophilic design, workplace, well-being, productivity, Malta.*

Rezumat. Scopul acestui studiu este de a examina suficiența locurilor de muncă din Malta – cel mai mic și populat stat membru al UE – în ceea ce privește proiectare biofilă și de a studia existența legăturii între componentele fizice și bunăstarea angajaților. Studiul cantitativ folosește un chestionar online distribuit tuturor angajaților care lucrează în serviciul public și autoritățile civile din Malta. Pachetul Statistic pentru Științe Sociale a fost utilizat pentru a analiza datele colectate. S-a constatat că prezența ferestrelor are cel mai semnificativ impact asupra bunăstării mintale, sănătății și dispoziției angajaților. Ei reduc anxietatea și măresc senzația de sănătate, inclusiv fericirea. Angajații care au lucrat în spații iluminate și ventilate natural au avut scoruri mai mari de productivitate și au fost mai puțin obosiți. Vederile clădirilor istorice au provocat același nivel de anxietate ca și vederile clădirilor și ale naturii combinate împreună. Rezultatele obținute reflectă experiența unei părți semnificative lucrătorilor de birou din Malta și oferă înțelegere aspectelor care trebuie de reluat în

conformitate cu principiile biofile. Aceste intervenții în proiectare oferă îmbunătățire bunăstării angajaților și creștere productivității la locul de muncă.

Cuvinte cheie: *design biofil, loc de muncă, bunăstare, productivitate, Malta.*

1. Introduction

Rapid urbanization resulted in densely populated cities and the disconnecting of citizens from nature. The interiors of buildings are primarily artificially finished and illuminated, exacerbating humans' detachment from nature [1]. Studies have shown that humans are inclined to opt for a natural/outdoor environment over an artificial/indoor one [2]. Whilst disconnected, we yearn for connection. 'Biophilia', a term expanded by Edward Wilson [3], refers to humans' innate love for nature and the intuitive desire to connect with it [4, 5]. Biophilic design is based on a hypothesis which merges life, nature and architectural understanding in the habitable environs, an approach which started gaining momentum a decade ago [6]. Daylighting, the introduction of plants, and window views directly and indirectly impact occupants [7]; they prove that biophilic principles are beneficial through the ripple effect(s) that they generate [5, 8].

A typical full-time employee spends a third of his/her working week at the workplace. Thus, the significance of the work environment on one's well-being cannot be underestimated [9]. Work spaces impact on stress and productivity [10]; absenteeism/sick-leave is an indicator. The immediate physical environment at the workplace should optimize workflow whilst reinforcing well-being [1, 11]. Such awareness runs low in Malta, the smallest yet most densely populated EU Member State. Psychosocial factors are main elements which impact employees at work, yet no reference is made to them in the official literature [12,13].

This research focuses on the connection between biophilic design and employee outcomes, namely well-being, productivity and creativity. Rather than arguing that a windowless and sensorially deprived office is a zoo cage [14], it is better described more as a closed container. This article is based on postgraduate research undertaken at the University of Malta by Farrugia [15]. The aims are to assess work environments in Malta and to identify whether, and to what extent, there is a relationship between employees' self-rated, health-related themes – anxiety, fatigue, happiness – and the physical characteristics of the workplace.

2. Background

Through anthropocentric actions, humanity has transformed its relationship with nature into an invasive one; "nature exists for man, who by means of an objective knowledge of its workings, harnesses it in the service of human ends" [16, p. 24]. The industrial revolution redefined the human–nature relationship [17]; nature became a resource exploited "as a process of commodification, that has made nature tradable in the market system" [18, p. 41]. Nature was transformed into a 'recreational amenity' [9]. Artificially lit and ventilated buildings prioritize architectural trends over 'place-appropriateness' [14, 19]. Failing to identify with one's place and space does impact on health and well-being [20]; once inside a building, the boundary of the space becomes the whole environment [19].

Experiencing nature allows better cognitive processes, thus mitigating stress [21]. Health-promoting environments are restorative; they "provide resources that can attenuate stress" and allow the surroundings to "function as a coping resource that can help building

occupants alter the balance between environmental demands and personal resources” [22, p. 91]. Although stress at the workplace depends significantly on the type of task, employees are more prone to stress-related disorders in technologically oriented jobs [23]; mental fatigue is leading to directed attention fatigue [21, 24].

Biophilia as a concept includes attributes through which humans experience nature [14]: (1) directly (views of nature, light, air, etc.), (2) indirectly (representations or transformations of nature) and (3) the experience of space and place (the creation of human habitat). Research has proven its validity [25]. Biophilic design is a holistic way of reading human nature and its interaction with different environs to ensure well-being [14, 26]. When the physical environment is not in phase with basic ecological needs, well-being is negatively impacted [27].

Openings fall under the first biophilic design attribute. Windows offer restoration to employees to cope with work related stress and anxiety whilst directly and indirectly affecting their health, well-being and mood [28, 29]. Daylight and views are two factors which dictate why windows are a priority for indoor environments. Job satisfaction is higher and stress levels are lower for windows with natural rather than urban views [30]. Absenteeism is influenced by the quality of the employees’ view from their window [31]. Connection to nature can be achieved via a window view and/or through indoor plants [30]. Further to aesthetic and decorative purposes, plants are beneficial to health in various ways: feeling of well-being, air purification and overall perception of the work environment [23, 30, 32, 33]. Overpopulating the office with them is, however, counteractive [33, 34]. Attention should be given to the tasks carried out and the needs of the occupants in order to implement beneficial office planting.

Plants reduce blood pressure in stress-inducing tasks and increase cognitive performance [35]. Employees were not bothered about the type of view, provided that they had a window to look out of; they decorated their space with images such as postcards and screensavers, thus resorting to the second attribute in order to satisfy the need to connect with nature [31]; such artificial views induce happiness through the indirect experience of nature [36].

Nature produces ripple effects on human health factors; “natural elements exposure influences mood and that mood in turn influences job satisfaction” [37, p. 12]. The benefits of biophilic design include the reduction and prevention of stress and mental fatigue which decrease illness and improve job performance [38]. Their ripple effects range from improvements in cognitive functioning [39] to reductions in absenteeism and staff turnover [38]. Unhealthy workplaces lead to unhealthy employees – 10% of absenteeism is credited to elements within the workplace environment; “workers in offices with poor ratings of light quality and in offices with poorer views used significantly more sick leave” [31, p. 8], thus leading to an economic burden [40]. The expenditure on mental health may exceed 4% of a country’s GDP [41].

The strategic policy document issued by the Ministry for Health outlines the impacts work-related sources of stress have on employees’ mental health and proposes ways for employers to optimize working environments to tackle them [42]. The physical environment as a potential source of stress and its health-related implications are never mentioned despite the fact that Malta has 29.3% (the highest in the EU, which has an average of 17.6%) of its workforce suffering from depression, anxiety and stress [43]. For two consecutive years, Malta – the EU Member State closest to the equator – ranked highest with 10% dimly lit dwellings,

circa twice the EU average [44]. Daylight allows the human body to maintain the right serotonin-melatonin balance [8] which allows the body to maintain the circadian rhythm and permits the neurological and immune systems to operate [37]. Polling office employees in Malta will reveal the physical characteristics of their workplace environments. This is particularly important to identify aspects which influence their well-being and how, in their opinion(s), they can be mitigated. Thus, the research questions were as follows:

1. What impact(s) do/does the presence of apertures, notably windows, have on the physical and mental health of the employees?
2. What impact(s) do/does natural light and ventilation have on the aptitude of the employees?
3. Which views from apertures are most health enhancing?

3. Materials and Methods

A quantitative study through the use of an online questionnaire, both in Maltese and English, was undertaken. (The English version is reproduced as an Annex at the end of this article.) Given the limitations generated by the COVID-19 pandemic, this method was deemed effective to reduce health risks. To minimize subjective results, the questionnaire involved comparing self-rated aspects to environmental characteristics.

In-depth, context assessments were undertaken prior to administering the questionnaire as, in itself, it does not constitute a scientific product unless supported by such evaluations. Thus, employees of different ages and backgrounds, working in different occupational sectors, job positions and office types within the civil service and public authorities were studied. The questionnaire was forwarded to all, numbering circa 30,000, via the People and Standards Division, Office of the Prime Minister, Malta. Specifically, this office demanded the removal of reference to gender: “remove the reference to sex as ultimately it does not bear any difference whether male, female or LGBTIQ ...”.

The survey – conducted over a 7-week period commencing on 30th March 2021 – was compiled through Google Survey. Those employees who were willing to participate answered the questions voluntarily and anonymously. The Statistical Package for the Social Sciences was utilized to analyze the data collected. A 5-point Likert scale – low (ratings 1 & 2), medium (rating 3) and high (ratings 4 & 5) – was applied for ease of legibility and enhanced interpretability.

4. Results

From the 456 responses, 348 answered in English and the remaining in Maltese. They fell into two main age groups: 46- to 55-year-olds (31.1%) and 36- to 45-year-olds (22.4%). The Northern Region (comprising Mellieħa, Mgarr, San Pawl il-Baħar, Rabat, Dingli, Mtarfa, Mdina, Mosta, Għargħur, Swieqi, Pembroke and Naxxar) and the Central Region (comprising Attard, Lija, Balzan, Birkirkara, Iklin, San Ġwann, San Ġiljan, Sliema, Gzira, Ta' Xbiex, Msida, Santa Venera and Pietà) were the regions where most of the respondents resided. The building type of their workplaces is given in Figure 1.

Over half of the workplaces (50.4%) are located within the South Eastern Region (comprising Valletta, Floriana, Marsa, Paola, Tarxien, Fgura, Bormla, Birgu, Isla, Kalkara, Xgħajra, Zabbar, Zejtun, Marsascala and Marsaxlokk) while 24.8% are in the Central Region. 82.9% have a window close to their workspace; views varied between buildings (26.8%), yards/courtyards (17.8%), buildings and busy roads (10.5%), sea views or fields (8%) and car parks (7%); 5.96% opened on to an internal shaft.

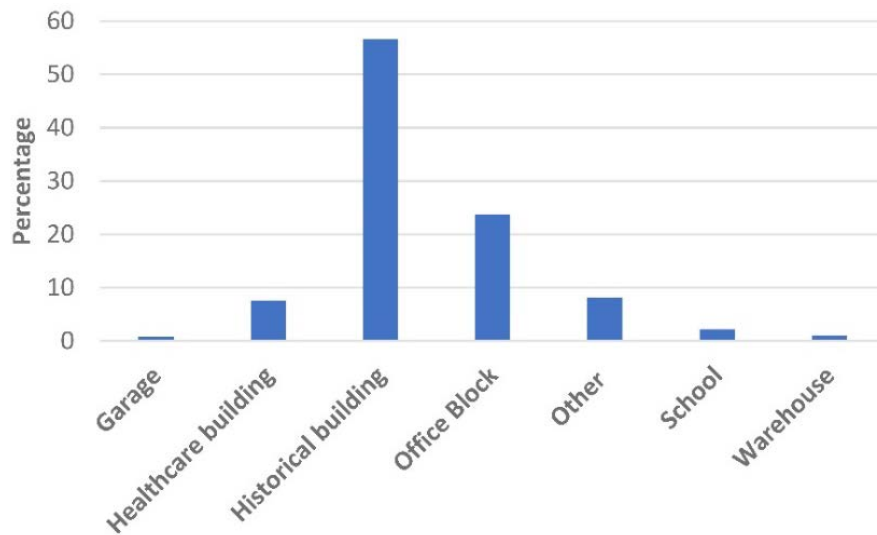


Figure 1. Workplaces in terms of building types.

Anxiety (Pearson Chi-Square: 0.038), how healthy the respondents feel (Pearson Chi-Square: 0.038) and happiness (Pearson Chi-Square: < 0.001) ratings with respect to window availability are given in Table 1.

Cross-correlated with the self-rated health related themes, the results with respect to feeling anxious (Pearson Chi-Square: 0.022), stressed (Pearson Chi-Square: 0.035) and happy (Pearson Chi-Square: 0.01) are given in Table 2. Only 40.7% of the participants had plants or a green space visible from their workspace. The Chi-square test provided a clear indication that the presence, or lack of, plants and green spaces was the least significant association between the two categorical variables assessed, namely, the group with visible plants or green spaces from their workspace and those who do not have such a view.

43.9% of the workplaces were naturally lit. The percentage impact on self-rated, health related, themes – anxiety (Pearson Chi-Square: 0.004), fatigue (Pearson Chi-Square: 0.021), and unproductivity levels (Pearson Chi-Square: 0.020) – are given in Table 3.

Table 1

Presence of windows at the workplace: cross tabulation (% ratings)				
Parameter	Criteria	Yes	No	Total
Anxiety	Low	60.0	44.9	57.5
	Medium	21.2	32.1	23.0
	High	18.8	23.0	19.5
Feeling healthy	Low	16.4	28.2	18.5
	Medium	37.0	35.9	36.8
	High	46.6	35.9	44.7
Happiness	Low	14.0	32.1	17.1
	Medium	36.0	34.6	35.7
	High	50.0	33.3	47.2

Less than a third (30.9%) of the workplaces made use of natural ventilation. Fatigue levels were higher in mechanically ventilated spaces: 34.8% felt very fatigued (Pearson Chi-Square: 0.001) versus 19% for naturally ventilated spaces, 52% of this group registering low levels of fatigue. Participants felt more unproductive (Pearson Chi-Square: 0.027) in mechanically ventilated spaces (12.8%) than in naturally ventilated ones (7.3%). 72.4% of the respondents who have naturally ventilated workplaces registered the lowest levels of fatigue.

Table 2

View from windows at the workplace: cross tabulation (% ratings)									
View type	Anxiety			Stress			Happiness		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Buildings only	49.5	24.2	26.3	44.5	22.2	33.3	20.2	35.4	44.4
Buildings/fields/se a views/gardens	79.4	10.3	10.3	62.1	20.7	17.2	10.3	24.2	65.5
Buildings and busy roads	59.0	25.6	15.4	46.2	28.2	25.6	20.5	30.8	48.7
Carpark	84.6	07.7	07.7	57.7	26.9	15.4	00.0	30.8	69.2
Yard/Courtyard	53.0	25.8	21.2	34.8	34.8	30.4	10.6	47.0	42.4
Sea views or fields	59.4	28.1	12.5	53.1	18.8	28.1	12.5	34.4	53.1
Historical buildings	79.3	17.2	03.5	79.4	10.3	10.3	10.3	24.2	65.5
Internal shaft	59.1	18.2	22.7	50.0	22.7	27.3	09.1	27.3	63.6
No window	47.6	29.8	22.6	42.9	21.4	35.7	29.8	36.9	33.3
Rooftops	57.1	28.6	14.3	28.6	42.8	28.6	28.6	57.1	14.3
Square	30.8	23.0	46.2	15.4	30.8	53.8	15.4	53.8	30.8
High level windows	70.0	10.0	20.0	40.0	40.0	20.0	20.0	40.0	40.0
Total	57.5	23.0	19.5	46.7	24.6	28.7	17.1	35.8	47.1

Table 3

Light source: cross tabulation (% ratings)				
Parameter	Criteria	Artificial	Natural	Total
Anxiety	Low	51.2	65.5	57.5
	Medium	28.1	16.5	23.0
	High	20.7	18.0	19.5
Feeling healthy	Low	43.0	56.0	48.7
	Medium	30.0	24.0	27.4
	High	27.0	20.0	23.9
Happiness	Low	63.3	75.5	68.6
	Medium	26.2	17.5	22.4
	High	10.5	07.0	09.0

Those who felt least unproductive have naturally ventilated workplaces. Health ratings (Pearson Chi-Square: 0.031) were lower for mechanical (25.5%) than for natural ventilation (15.2%). There was a 6.3% difference between the two groups for the highest rating of happiness: 46.7% for naturally ventilated spaces versus 40.4% for artificially ventilated ones. The highest discrepancy between health ratings for the two subpopulations was for creativity (Pearson Chi-Square: < 0.001). 41.8% of respondents of mechanically ventilated workplaces felt low creativity levels at work, almost twice the figure for naturally ventilated ones. A difference for the medium and high creativity ratings is present – the naturally ventilated group is characterized by higher percentages.

A significant number of the respondents (69.5%) spend their lunch break at their desk; 13.8% go for a short walk, 4.8% make use of their workplace's indoor recreational area and

1.8% utilize outdoor recreational ones. Over 75% of those who do take a break rated their anxiety levels as 'low' (Pearson Chi-Square: 0.001); the highest levels of anxiety were reported in the group of those who do not have a break (57.1%), followed by those who run errands, go home or spend their break at their desk. The least fatigued were those who spend their break outdoors (81.3%; Pearson Chi-Square of > 0.001); 71.4% of those who do not have a break rated fatigue as 'high'.

Of respondents who rated their health as high, 84.3% and 10.8% rated their unproductivity levels as lowest and medium respectively. 21.4% of those who feel least happy at work feel a high level of unproductivity, versus the 4.9% who feel happiest at work and feel high unproductivity levels. With respect to the happiness ratings, of those feeling the lowest happiness levels, 41% feel low unproductivity levels; this percentage more than doubles for high happiness levels, with 86% experiencing both low levels of unproductivity and high levels of happiness. Similar results were obtained for higher unproductivity levels, where 25.6% of those experiencing low levels of happiness rated their unproductivity as high, a much larger percentage than for both those experiencing medium (8%) and high (3.7%) levels of happiness.

Natural light, ventilation, views and a pleasant work environment are important to facilitate and fulfil one's tasks at the workplace (15.8% were indifferent, and 14.5%, 11.4% and 9.2% opted for the integration of nature and natural spaces, for a more pleasant overall environment and for natural light and ventilation respectively). 19.5% of the respondents holds the relationship with colleagues as the main priority.

5. Discussion

The mean of windowless workplaces in Europe, the Middle East and Africa is 7% [45]. This is significantly lower than in Malta, which stands at 17.1%. Views of nature or with nature integrated within the frame decrease stress levels [30], improve productivity [29] and improve employee moods [33, 37]. Low stress was experienced by the occupants of workplaces which incorporate nature and those with sea views or fields, findings which comply with Kaplan [30]. Lower anxiety levels were reported for views of historical buildings and buildings with nature together. This may be due to the use of the honey-colored Lower Globigerina Limestone which outcrops over circa two-thirds of the Island's topography – "physical and psychological exposure to natural materials typically evokes a strong, and frequently deeply satisfying and beneficial, human response" [14, p. 60].

In all cases, anxiety, stress, health, happiness and creativity had better ratings with respect to views of nature and the integration of plants. Lower ill-feeling levels coincide with naturally lit environments while the converse is true. The highest significance between the type of light and health relates to anxiety (Pearson Chi-Square: 0.004), a finding in line with An et al. [37]. Mental health, notably depression and anxiety, are affected by sunlight penetration indoors. In agreement with Sanchez et al. [24], fatigue levels were less in naturally lit workplaces.

With respect to natural ventilation, there is a significant association between health and the type of ventilation. It impacts creativity and fatigue ratings whilst having less impact on ratings for unproductivity and health. Such findings are in line with the study by Browning et al. [8]. The presence of indoor plants or green spaces have less influence on health than the presence of windows, a finding which supports Chang and Chen [46]. People may opt to stay indoors instead of going for a walk due to excessive pollution and/or a lack of green

spaces [47]. Going out for a walk or spending time in green spaces is more popular with those who do not have a window, whose window leads to an internal shaft and those with views of carparks and roads. Fatigue ratings were mostly affected by experiencing green spaces outdoors or going for a short walk, findings which tally with Berman et al. [39].

The correlation between unproductivity and happiness and health is inversely proportional. The findings sustain Tennessen and Cimprich's argument, that the happier and better your mood, the more productive you feel [29]. Re-ordering the workplace layout can improve the overall setting. By desk rotation, the employees can be made subject to:

- (i) outdoor views,
- (ii) more natural light illuminating their workplace, and
- (iii) a decrease in the need for artificial light.

Figure 2 includes conceptual sketches which illustrate a deeper connection of the workplace with nature. The incorporation of biophilic design principles is more flexible in new buildings; they can strategically and meticulously be incorporated at the design inception stage to fulfil its restorative effects [48]; orientation and/or the introduction of an atrium/courtyard with services restricted to the core free the periphery to optimize daylighting and ventilation.

6. Conclusions

The outcomes of the study reinforce the employees' preference for natural elements. The following are the key findings of the research:

1. The presence of windows:
 - (i) reduces anxiety by 10%,
 - (ii) increases perceived health ratings by 7.5 %, and
 - (iii) increases self-rated happiness by 11.7 %;
2. Natural light led to:
 - (i) an average increase of 8 % in productivity,
 - (ii) a reduction of anxiety by 9.5 %, and
 - (iii) a decrease of 8.7 % in fatigue;
3. Employees working in naturally ventilated places experience, on average, 10.5 % less fatigue;
4. According to Table 2, a view to a car park seems to be a very strong criterion for feeling happy, actually the strongest of all the mentioned criteria; the second strongest criterion is a view of historical buildings; and
5. A view of historical buildings from the workplace resulted in the same anxiety levels as views of buildings and nature integrated together. Such a view seemed more stress attenuating than those involving nature and/or buildings with nature. Views of nature and of historical buildings are both rated highly and equally for the delight they generated.

Conclusions about views, windows and natural ventilation suggest the need for considering how important ambient factors in the office environment are for efficiency and wellbeing. Prioritizing employee's well-being and fatigue levels through health promoting spaces at the workplace benefits the occupants. Core to biophilic design is its being a type of architecture which address these conclusions in a holistic manner. Hence, opting for biophilic-sensitive architectural retrofitting or new designs for the workplace is a solution. In the case of retrofitting, re-organizing the workplace layout can improve the overall setting. The incorporation of biophilic design principles is easier in new buildings.

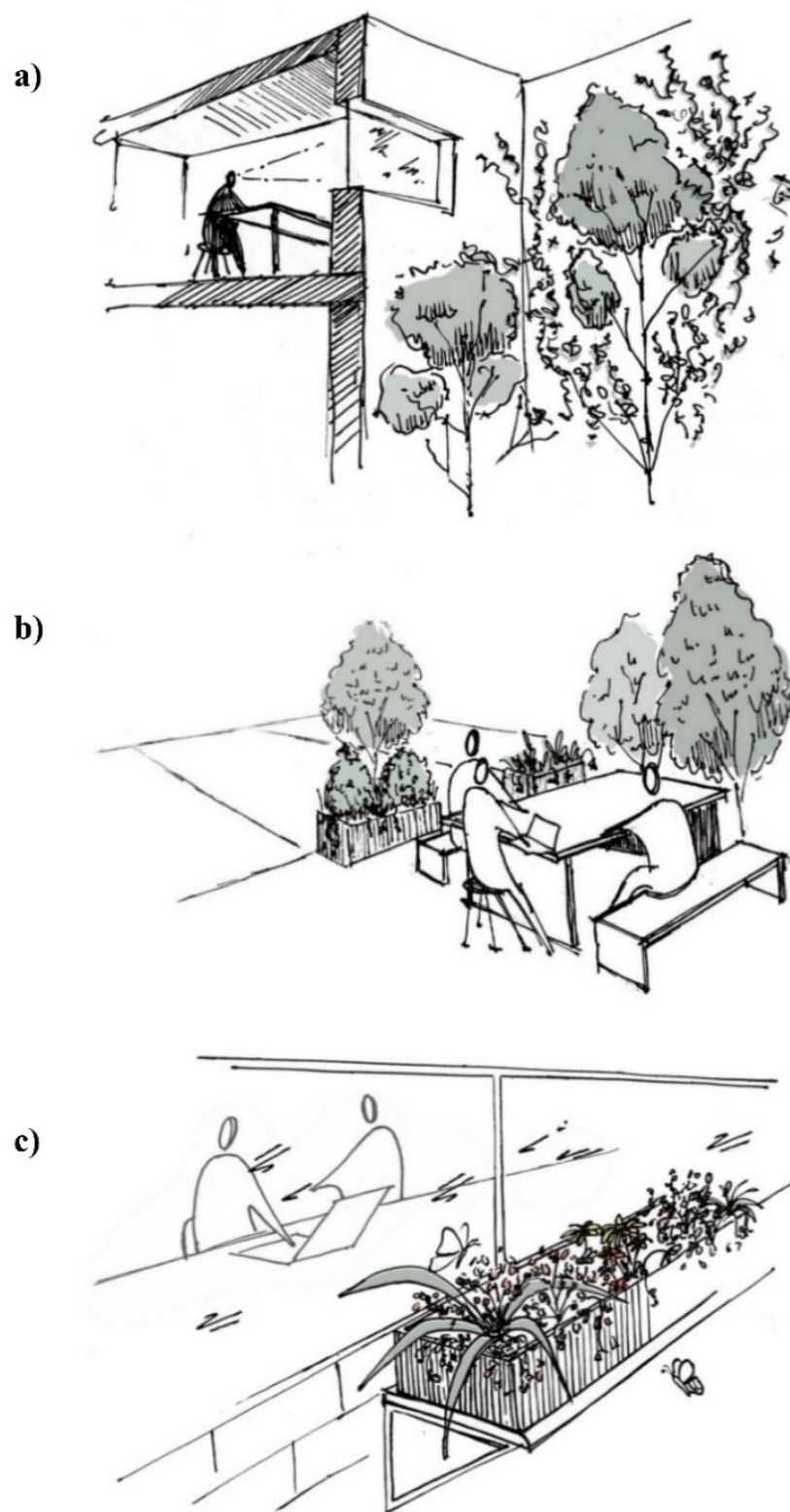


Figure 2. A deeper connection of the workplace with nature: a) greening of blank walls and courtyards; b) parking spaces transformed into parklets for employees; and c) harboring a deeper connection with nature and its ecosystems [15].

The COVID-19 pandemic has profoundly changed the working models under investigation, massively introducing the smart working that forces us to completely review the relationship between the employee and his/her workplace. Thus, it is recommended that this study is reconducted post COVID-19 restrictions and consider including questions regarding:

- (i) gender (maybe to include 'other' besides male and female),
- (ii) the health status of the participants (for example, any health conditions and diseases, medication taken, the number of hours of sleep, physical/sport, activities, stimulants such as coffee and/or energy drinks etc.),
- (iii) number of hours of work performed per day,
- (iv) type of work (computer, etc.),
- (v) office/building type(s),
- (vi) office/building's locations, and
- (vii) overshadowing of neighboring buildings, to have a more precise view on the particular work environment.

It is imperative that the type of work environment is more precisely defined. Furthermore, although the questionnaire was sent to all those in the civil and public authorities, the respondents seemed to be engaged in office work/work in public administration/white collar work, which is completely different from working in a hospital, eldercare center, building site, etc. Thus, a reading through the "reflection-in-action" notion as developed by Schön in his seminal publication *The Reflective Practitioner* [49] will give more insightful understanding of the findings.

Limitations: This research was undertaken during the COVID-19 pandemic which introduced constraints on the Malta study [50]. Existing office spaces could not be accessed due to controls introduced by the Ministry of Health, Malta, and most of the employees were teleworking on a rotational basis. During this time, companies made an effort to provide safe workplace environments by implementing: personal protective equipment; environmental adjustments such as improving ventilation, adding physical barriers to prevent physical contact and environmental cleaning; and organizational changes such as facility zoning and entry restrictions. However, despite the numerous workplace measures taken in response to the COVID-19 crisis, employees still expressed a high level of fear and concern about the disease [51]. The stress factor of the pandemic itself might significantly alter the employees answers and satisfaction which could influence the end results of the performed research.

Institutional Review Board Statement: During the meeting held on the 20th January 2021, the Faculty Research Ethics Committee of the Faculty for the Built Environment, University of Malta, approved the questionnaire and requested that professionals identified in the research will provide their consent. The unique form ID is 7450_15012021_Gabrielle Farrugia. All the data collected will be deleted within 4 years from publication. Clearance was secured through the Permanent Secretary, People and Standards, Office of the Prime Minister, Malta, after reference to sex of the responds was deleted.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the questionnaire. Links to the google forms surveys, one in English (<https://forms.gle/wYG6U795EEExd1ENA>) and the other Maltese

(<https://forms.gle/a5izcUhuSAGxceAJ6>). It was distributed through a mail shot to all employees via the Research and Personnel Systems Directorate, Office of the Prime Minister, Malta. An information letter about the purpose of the survey in the respective language was attached to the email to be read before employees responded to the survey.

Data Availability Statement: Data supporting reported results are available from Gabrielle Farrugia (email: gaby.farrugia@yahoo.com) upon request.

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Conflicts of Interest: The authors declare no conflict of interest.

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Annex:

Questionnaire

Section 1 - Demographics

1. What is your age?
2. In which locality do you live?
3. In which locality do you work?
4. What is your level of management at your work place?

Section 2 - Physical characteristics of the workplace environment

5. Building type:
 - a. What type of building is your workplace situated in?

- i. a historical building,
 - ii. an office block,
 - iii. a converted building, or
 - iv other.
- 6. Ventilation in your workspace:
 - a. Is the ventilation in your workplace natural (for example, windows/courtyard/loggia) or mechanical (for example, air conditioner)
- 7. Main light source:
 - Is the main light source in your workplace natural or artificial?
- 8. Views from your work area/desk:
 - a. Do you have a window close to your workspace/desk? Yes/No.
 - i. If the answer is yes, what is the view from the window?
 - b. Do you have any plants or green spaces visible from your workspace/desk? Yes/No.
- 9. Does your workplace have any green outdoor/indoor space (balconies, courtyards etc.)? Yes/No.
- 10. Are any of the following materials and colors found in the workplace/desk?
 - a. stone - Yes/No,
 - b. wood - Yes/No,
 - c. brick - Yes/No,
 - d. bamboo - Yes/No,
 - e. please specify any other materials with a natural connection,
 - f. please specify the colors found in your workplace.

Section 3 - Influence of workplace environment on employee's well-being and productivity
(psychological effects)

- 11. Do you think there is a relationship between your health and your productivity at work (mood)? Yes/No
- 12. How do you feel going into work? (Rate on scale of 1-5; 1: lowest, and 5: highest):
 - a. anxious,
 - b. stressed,
 - c. fatigued/tired,
 - d. unproductive,
 - e. healthy,
 - f. happy, or
 - g. creative.
- 13. How do you feel at work? (Rate on scale of 1-5; 1: lowest, and 5: highest):
 - a. anxious,
 - b. stressed,
 - c. fatigued/tired,
 - d. unproductive,
 - e. healthy,
 - f. happy, or
 - g. creative.
- 14. How do you spend your break?
 - a. at your workspace/desk,

- b. in an outdoor recreational area at your workplace/desk (if any),
 - c. go outdoors - green spots/nature/seaside, or
 - d. go for a short walk.
15. How do you feel after your lunch break? (Rate on scale of 1-5; 1: lowest, and 5: highest):
- a. anxious,
 - b. stressed,
 - c. fatigued/tired,
 - d. unproductive,
 - e. healthy,
 - f. happy, or
 - g. creative.
16. How do you feel when out of work? (Rate on scale of 1-5; 1: lowest, and 5: highest):
- a. anxious,
 - b. stressed,
 - c. fatigued/tired,
 - d. unproductive,
 - e. healthy,
 - f. happy, or
 - g. creative.

Section 4 - Suggestions

- 17. What qualities do you prioritize in your work environment which allow you to fulfill your job tasks and facilitate your work flow?
- 18. What qualities of your work environment do you believe have a negative impact on your health and productivity (mood)?
- 19. What physical features would you change in your workplace/desk environment and why?

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