



Psychosocially Supportive Design within Workplaces

التصميم المساند نفسياً واجتماعياً في بيئة العمل

By

Jeehan Nafiz Al Azzazi

Student ID number: 2013217052

**Dissertation submitted in partial fulfilment of
MSc Sustainable Design of the Built Environment**

Faculty of Engineering & Information Technology

Dissertation Supervisor

Professor Haşim Altan

June-2016

DECLARATION

I warrant that the content of this research is the direct result of my own work and that any use made in it of published or unpublished copyright material falls within the limits permitted by international copyright conventions.

I understand that a copy of my research will be deposited in the University Library for permanent retention.

I hereby agree that the material mentioned above for which I am author and copyright holder may be copied and distributed by The British University in Dubai for the purposes of research, private study or education and that The British University in Dubai may recover from purchasers the costs incurred in such copying and distribution, where appropriate.

I understand that The British University in Dubai may make a digital copy available in the institutional repository.

I understand that I may apply to the University to retain the right to withhold or to restrict access to my thesis for a period which shall not normally exceed four calendar years from the congregation at which the degree is conferred, the length of the period to be specified in the application, together with the precise reasons for making that application.

Jeehan Al Azzazi
Signature of the student

COPYRIGHT AND INFORMATION TO USERS

The author whose copyright is declared on the title page of the work has granted to the British University in Dubai the right to lend his/her research work to users of its library and to make partial or single copies for educational and research use.

The author has also granted permission to the University to keep or make a digital copy for similar use and for the purpose of preservation of the work digitally.

Multiple copying of this work for scholarly purposes may be granted by either the author, the Registrar or the Dean of Education only.

Copying for financial gain shall only be allowed with the author's express permission.

Any use of this work in whole or in part shall respect the moral rights of the author to be acknowledged and to reflect in good faith and without detriment the meaning of the content, and the original authorship.

Thesis Abstract

This thesis has been written to discuss psychosocially supportive design within work places. It is no secret that built environments had affected our lives massively, work places in particular since we are spending almost 8 hours of our days at working environments. Therefore, the starting point of the research will display buildings' roles in our lives and their influences on human lives. Similarly, the research will retail work places history, offices developments through years and their variable effects on our physical, mental, psychological and social health. Human health as well have its share of the research's discussions, where the author discusses different health definitions, parameters, aspects and ways to promote human health. Moreover, since stress has great effect on human health, therefore, its causes and influences were discussed regarding human health and the individual ability of adapt with different levels of stress on the expense of his/her health; it was also taken in consideration in the research methodology. A survey was distributed among employees with different work places to collect general data about various work environments. The survey asked questions regarding the participants' working environments such as; traffic, offices plan layout, desks directions, offices finishes, furniture materials, colours used, wall openings, natural elements availability, lighting, technology, utilities, social interactions and the employees stress level. Results were analysed through IBM SPSS Statistics Data Editor Software, it showed that only 7.3% of participants feel comfortable within their workplaces while 27.3% are feeling stressed and unhealthy due to the internal conditions of their work places. Based on the questionnaire results and the participants' opinions restorative theories were discussed to study the possibility of implementing nature accordingly and to educe number of parameters and characteristics of a psychosocially supportive design within work places, which considered the research main purpose.

ملخص الأطروحة

بتيسير من الله تعالى وتوفيقه تم الانتهاء من كتابة أطروحة درجة الماجستير في التصميم المستدام للبيئات المبنية, بحيث تتناول الأطروحة موضوع التصميم المساند للجوانب الاجتماعية والنفسية للموظف في بيئة عمله, و يكاد لا يخفى علينا جميعا أن البيئات المبنية تترك آثارا جمة على حياة الانسان وصحته بالأخص مكان العمل الذي قد يمضي فيه الانسان 90 % من حياته تبعا للدراسات والإحصائيات المتداولة. وبناء عليه سيتم التطرق لأهمية دور البيئات المبنية في حياة الانسان وتأثيرها على صحته بالإضافة الى تأثير بيئات العمل, تاريخها, تطورها و اختلاف تأثيراتها على الصحة الجسدية, النفسية, العقلية والاجتماعية للانسان.

كما كان لصحة الانسان نصيب في المواضيع المناقشة في الأطروحة نظرا لارتباطها الأساسي مع المواضيع المطروحة, بحيث تمت مناقشة تعريف الصحة, جوانبها, عواملها المختلفة وطرق تعزيز صحة الانسان المختلفة. ونظرا لارتباط صحة الانسان بالتوتر والاجهاد الناتج في مكان العمل والذي يترك تأثيرا ملحوظا على صحته فقد تمت مناقشة أسبابه وآثاره وقدرة الانسان على التأقلم مع مسبباته والتي غالبا ما تكون على حساب صحة الموظف الجسدية والنفسية, اضافة الى أخذه بعين الاعتبار في المنهجية المتبعة في الأطروحة.

اعتمدت منهجية الأطروحة المتبعة على دراسة استقصائية تم تحضيرها من قبل الكاتب و توزيعها على عدد من الموظفين العاملين في أماكن متفرقة للحصول على نطاق واسع من البيانات الخاصة ببيئات عملهم المختلفة. ضمت الدراسة الاستقصائية أسئلة متفرقة ذات صلة ببيئة العمل وجوانبها كالازدحام حول المكتب, التوزيع المتبع للمكاتب, اتجاه مكتب الموظف, تشطيبات مكان العمل, الأثاث المستخدم, الالوان المستخدمة, توفر فتحات جدارية, توفر عناصر طبيعية, الاضاءة المستخدمة, توفر وسائل التقنية الحديثة والمرافق العامة ومناطق التفاعل الاجتماعي بالإضافة الى أسئلة ذات صلة بدرجة الاجهاد و التوتر التي يعاني منها كل موظف على حدة. وبناء عليه فقد تم تحليل نتائج الدراسة الاستقصائية باستخدام برنامج محرر بيانات (IBM SPSS Statistics Data Editor Software) لضمان دقة النتائج والقراءات, التي أظهرت أن ما يقارب 7.3% فقط من المشاركين في الدراسة يشعرون بالراحة في بيئات عملهم بينما 27.3% يشعرون بالاجهاد الدائم المصاحب لأعراض مرضية نتيجة لظروف بيئات عملهم الغير صحية.

بناء على نتائج الدراسة الاستقصائية وآراء الموظفين التي أخذت بعين الاعتبار, تمت مناقشة نظريات التجديد والتصميم المساند لدراسة امكانية دمج الطبيعة لاستنباط مواصفات البيئة المساندة للجوانب الاجتماعية والنفسية للموظف في مكان عمله والذي يعد هدف الأطروحة الرئيسي.

Table of Contents

Table of Contents	1
Introduction	3
Chapter one: Work Places	6
Introduction	6
Buildings' roles in our daily lives	6
Work places history	9
Workplaces development through years	14
Creating offices for functioning only by neglecting psychological, social and spiritual needs	15
Summery	17
Chapter Two: Human Health	18
Introduction	18
Health definition	18
Human health parameters	19
Physical health	19
Mental health	24
Social health	27
Promoting human health	28
Pathogenic and Salutogenic health	30
Summery	33
Chapter Three: Work Places and their Effects on Human Health	34
Introduction	34
Physical environment	34
Indoor environment effects on human health	36
Air quality	36
Thermal quality	37
Acoustic quality	38
Lighting quality	39
Human adaptability	40
Instability of stress	42
Summery	43
Chapter Four: Methodology, Analysis and Results	44
Introduction	44
Analysing the questionnaire parameters	47

Work place location	47
Office layout	50
Employee’s desk position	54
Work place materials and colours	57
Wall openings and natural elements	57
Lighting and technology availability	62
Social interaction areas and utilities availability	64
Crowding possibility	66
Summery	67
Chapter Five: Discussion: Nature Implementations Based on Restorative Theories’ Principles	68
Introduction	68
Nature effects on human health	68
Restorative theories and suggested nature implementations	70
Summery	73
Chapter Six: Psychosocial Supportive Design Suggested Parameter..	74
Introduction	74
Supportive design characteristics	74
Sense of control and security	74
Social support	75
Physical movement possibility	75
Visibility and accessibility	76
Physiological Comfort	76
Quietness.....	77
Positive design features	77
Summery	78
Conclusion	79
References	81
Appendices	85
Appendix A.....	85
Appendix B.....	86
Appendix C.....	87
Appendix D.....	88

Introduction

Psychosocially Supportive Design can be considered a movement that existed since the early beginnings of the twentieth century, when awareness was increased among designers' society to create built environments that can promote human health and prevent illness causes and factors. Theories, studies and experiments were conducted as attempts to create health supportive designs within built environments especially in health sector's buildings where it is needed the most.

One of the leading theories and studies that left great effects on the development of supportiveness theories is Aaron Antonovsky's, a sociologist who concentrated on the relationship between physical, mental, psychological and social health (Dilani 2001, p.13). He suggested the term "Sense of Coherence" that in his opinion can help the space user coping with the surrounding environment and thus remain healthy, in addition to the term Salutogenesis by which the built environment in its turn can offer physical, mental, psychological and social support to the space users to preserve their wellbeing and health (Towery 2013).

Although Antonovsky discussed supportiveness at his time, however, the official use of the term "Psychosocially Supportive Design" did not appear among the designing society till the late years of twentieth century. Alan Dilani the founder and Director of the International Academy for Design and Health, is one of the many designers that were effected by Antonovsky's studies and he is also one of the leading names when it comes to psychosocial supportive designs and health promoting.

Dilani's modern theory in 2007 concentrated on defining human health according to the individual's needs. He discussed health within two definitions; biomedical and holistic. Biomedical health refers to a body condition that is free of diseases and illnesses, while holistic health examines different dimensions of health, which are physical, social,

psychological, emotional and spiritual. In his opinion, achieving the ideal supportive indoor environment needs both points of view to be taken in consideration for the benefits of space users (Dilani 2007, p.56). However, holistic dimensions are not usually taken into account when designing built environment nowadays, which causes different health and psychological problems. Therefore, the main concern of a psychosocially supportive design is directed mostly to the holistic definition; it studies the four needed supports within indoor surrounding starting with physical elements, social support which is related significantly to the physical one and affects the psychological and emotional supports greatly (Dilani 2007, p. 56).

Consequently, psychosocially supportive design aims to provide the required psychological, social and spiritual needs within the indoor environment in order to improve the internal space efficiency. It does not only intend for a healthy ambience, it also means to provide a mental status where the user can avoid stress, impatience and irritation, and to create an atmosphere where one can feel creative, enthusiastic, passionate, comfortable and mentally stable.

Accordingly, this research will discuss psychosocial supportive design with the concentration on workplaces environment and employees psychological and social health since people are spending most of their days within their workplaces. It will review human health including health definitions, parameters and promoting. It will also display buildings' roles in our lives including workplaces and their effects on human health. Furthermore, the research will go cross human adaptability and instability of stress as part of its literature review that will help the author moving to the research purpose and methodology.

The research main purpose is suggesting some design parameters of a psychosocial supportive design within work environments in addition to defining some restorative spaces' characteristics. It also studying the possibility of nature implementations and integrations within work places designs as attempt to provide supportiveness by nature effects and influences on human health.

To achieve the research main purposes, a collective data methodology was chosen as the most suitable method for such purpose. A survey was distributed among number of employees; it consisted of questions related to the indoor environments conditions at their work places in addition to their health status during working hours.

The survey questions were asked according to the research literature review and the data collected from it, such as the most effective indoor environment parameters and its influences on human health. The participants' answers were collected, sorted and analysed through IBM SPSS Statistics Data Editor software to assure data accuracy. The methodology main directive was a stress level scale that the author used as a reference for the indoor environment parameters discussed in the questionnaire.

The survey also contained additional questions regarding the employees preferable work conditions, which were compared with their current conditions and stress level.

Furthermore, nature effects were kept in mind during collecting and analysing the questionnaire results to assure its existence as possible solution at the end of the research through natural implementations and integrations, which are based on restorative theories to achieve its main purpose.

Finally, the research expected outcomes should be able to answer its raised question; how can the built environment (work places in particularly) provide psychosocial supportiveness for their occupants and what nature can offer in this term.

Chapter One

Work Places

1. Introduction

The built environment can be considered humanity's great implementation, humankind from their early beginning knew the importance of sheltering their selves from our great mother; Nature. Buildings through centuries did their main purpose of protecting humankind from the fickle natural environments; buildings also provided humankind with safe and protective spaces where he/she can practice their humanitarian activities to promote human welfare; eating, sleeping, interacting, working and any other action that expresses humanity.

In this chapter, the researcher will address buildings' role in human life in general and workplaces in particular since the research is discussing supportive design within workplaces. It will also display workplaces history and how they were created, formed and developed through centuries till current day where most of offices are been created for functioning only by neglecting physical, social and spiritual needs of human being.

2. Buildings' roles in our daily lives

It is no secret that buildings have great role in our lives, most of our days are spent within internal environments; residential, industrial, commercial, health care facilities, cultural facilities, educational and other buildings where we spend our days in, all have their print in our lives.

The influence of the built environment on human is emerged from the human need to control his/her surrounding in addition to the need to feel free but yet safe and secure at the same time. Building with their

components offer these basic needs to human, within internal built environment human can feel safe and secured from the possible dangerous nature outside; weather, natural disasters, wild life and so. On the other hand, buildings allow the human to feel controlling over his/her surrounding within the internal built environment, inside the built environment human can control light, temperature, air direction, spatial arrangement, sound and noise. These basic human needs reflected on the human mental, physical, psychological and social status.

Furthermore, what buildings provide or prevent affect human health massively; natural daylight, natural ventilation, landscape views and noise all have influences on human health. Sick building syndrome is a phenomenon that describes buildings' effect on human health very well, it happens due to a stressful internal environment that occupants suffer from, lack of proper ventilation, poor thermal, toxic building materials, poor day light and absence of natural elements are examples of what can cause Sick Building Syndrome. Some of the sensible symptoms are headache, stress, dizziness, chest tightness, respiration problems, stinging eyes, chills, fever and irritation (Sarbu & Sebarchievici 2011). Figures 1 and 2 below show Sick Building Symptoms percentages and their causes.

SICK BUILDING SYMPTOMS

- Headaches
- Dry Throat
- Eyes Irritation
- Runny Nose
- Flu Symptoms
- Stuffy Nose
- Lethargy
- Chest Pain
- Heavy Breathing

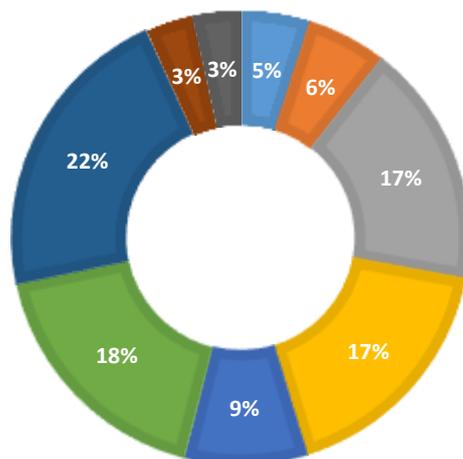


Figure 1: Sick Building Symptoms Distribution (Sarbu & Sebarchievici 2011).

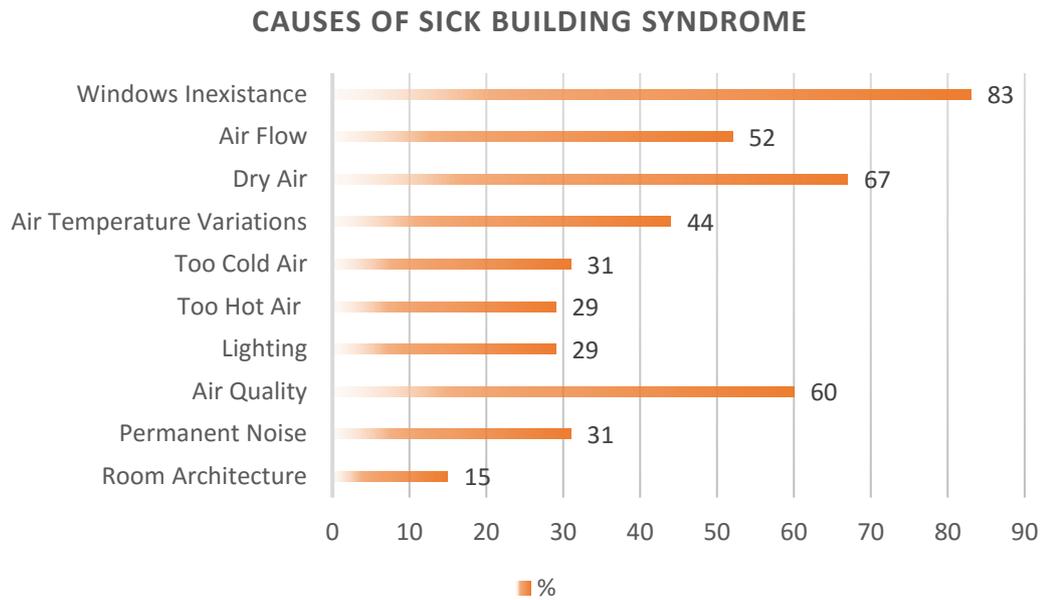


Figure 2: Causes of Sick Building Syndrome (Sarbu & Sebarchievici 2011).

Sick Building Syndrome’s main reason is a stressful environment, existing of specific factors or their absence causes changes within the surrounding environment and thus occupants’ perception. Either physical, mental or social changes all can leave the occupants uncomfortable and so stressed, work places are the common stressful environments with continues effective changes. Admittedly the most regularly occupied buildings nowadays are work places, most of employed people spent their working hours within offices, nearly 1,900 hours per year are spent inside the office during employee’s life. Therefore, offices buildings are exposed to various factors that can escalate Sick Building Syndrome possibility (HSE 2000). Not like other buildings, suffering from health problems during working days has cost side effects represented as; poor efficiency, sick leaves, low productivity, bad attitudes and thus complains. So, in order to achieve the main reason behind offices buildings, business superiors shall keep in mind providing healthy, suitable, encouraging and supportive work environment for their employees to minimize financial risk and avoid losses.

3. Work places history

Defining workplace through history varied according to the place purposes; at the early beginnings, offices were defined as a place which could or could not include walls or partitions, where human practiced laws writing and regulations issuing for the state. Offices at that time in addition to describe a place of work, it also described the job or the designation itself so the clerk would be called an office as an indication to his job. The state organization which was the main engine of any country at that time before the existing of private businesses controlled the industrial and commercial business sector, therefore work places used to be located within the governor palace or the state temple, they were also called librarians since “writing” was the main function within these spaces (Aardex 2004, p.13).

At the early beginning the Roman Empire was a head of other cultures on writing and preserving parchments, however, a while later the Rome Empire collapsed and so other cultures such as Byzantium and Islam took the lead on documentation field.

Later on, at the high middle ages, years between 1000 to 1300 A.D, public records offices didn't change much, walls then were permanent component of an office, and thus particular spaces were set as offices for more secrecy and privacy to comply with the state administrating requirements. Offices walls used

Office design at that era meant to be prepared for different purposes; writing state declarations, issuing regulations, writing official letters, writing books, reading correspondence, meetings in addition to other tasks which can include personal affairs, a common feature of office rooms were pierced walls; documents were preserved and archived within holes through office's walls to protect the stiff, flat, thin materials that documents were made from.

Later on, commercialism dominated and venture capitalists preferred managing their businesses on site, thus offices appeared at factories, shops, leased buildings, groceries and other industrial buildings (Aardex 2004, p.13).

Consequently, the early fifteenth century can consider the start of offices appellation according to the business tasks conducted inside such as law office or accounting office. Furthermore, businesses located their offices in the city centre so demands on empty spaces within buildings increased and the city centre witnessed population raise. As a result, offices buildings were constructed to include only offices but not before the eighteenth century, when the Admiralty buildings emerged to take in the massive number of employees who were hired by the ROYAL Navy to address the state documents, forms and letters(Aardex 2004, p.13).

In the middle of the eighteenth century, the industrial revolution took place, and thus the need for more offices, however, the limited lands within the city centres imposed multi stores buildings which were possible after the invention of safety elevators by Elisha Otis in 1852(Aardex 2004, p.13).

In the 1900's considerations raised to increase the industrial efficiency, so sights were then directed to the internal designs of the offices buildings since the space was not an obstacle any more. F.W.Taylor a mechanical engineer suggested that for a better production; managers need to monitor their employees during operating, therefore he came out with the open plan offices. In his version of open plan offices, employees were functioning on a desk consists of horizontal bar and drawers below directed to their managers or supervisors desk to allow total view of an operating employee (Aardex 2004, p.13).

Nevertheless, the monitored employee desk concept didn't remain in existence, especially at the beginning of the twentieth century when it was clear to industrial superiors that the existed office designs were holding back their employees and were not efficient enough to increase productivity and to ensure performance creativity as they were supposed to. Therefore, new desk design was implemented; Cubicle desks consisted of the horizontal bar and the drawers below as the previous design with the addition of partitions rises on top of the desk level to provide enough privacy for the employees but still not a complete one (Aardex 2004, p.3).

Undoubtedly, open plan offices still the dominant office structure world wide till current day for the benefits of the extra spaces it provides which can be invested for other purposes. Within the open plan office; one can find work spaces, meeting spaces and support spaces all distributed within the floor plan to create one unit. Figures 3, 4 and 5 below show some of the spaces and utilities that one can find within a work place (Aardex 2004, p.13).

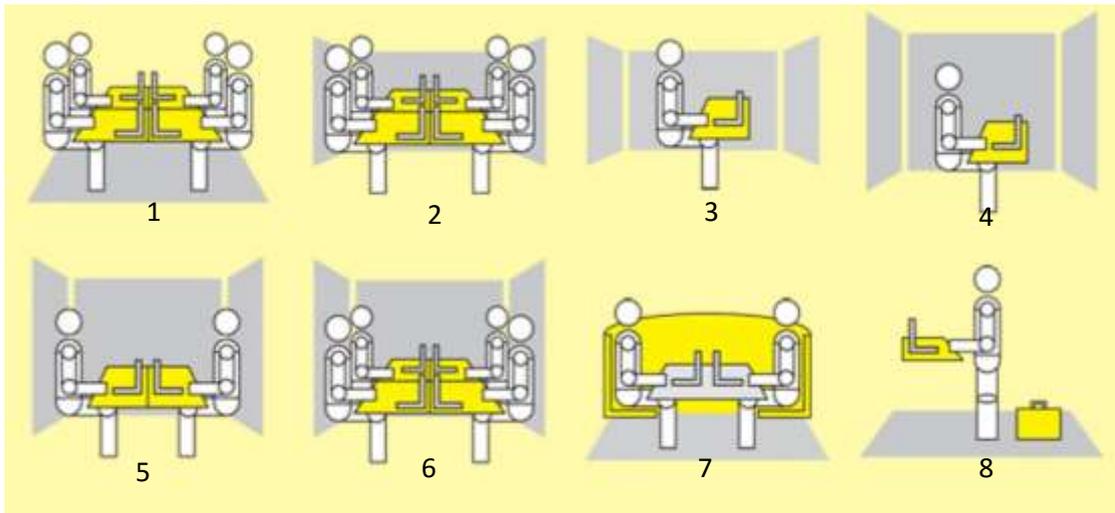


Figure 3: Work Places designs within offices (Planning Office Spaces 2010).

Figure number 3 shows work spaces designs suggested by Planning Office Spaces Organization where;

1. *Open Office Layout*: allows interaction and low concentrated tasks.
2. *Team Space Layout*: allows team interaction and little concentrated tasks, takes from two to eight employees.
3. *Cubicle Layout*: provides enough interaction and focusing for one employee.
4. *Private Office Layout*: ensures total privacy and complete concentration for the employee with the possibility of conducting small meetings.
5. *Shared Office Layout*: convenient for small group; two to three employees, allows team activities and medium concentrated tasks.
6. *Team Room Layout*: allows team work and secrecy at the same time, can take in four to ten employees.

7. *Work Lounge Layout*; allows interaction and cooperated and short term tasks for a group of two to six.
8. *Touch Down Layout*: a short term task space for one person who doesn't need either concentration nor privacy.

Planning Office Spaces Organization suggested also meeting spaces designs within offices as shown in figure number 4;

1. *Small Meeting Room*; convenient for both official and nonofficial private meetings and can take in two to four people.
2. *Large Meeting Room*: can take in ten or more persons and convenient for official meetings only.
3. *Small Meeting Space*: can take one person to four for a small unofficial meeting that doesn't required secrecy.
4. *Large Meeting Space*: five to twelve persons can be gathered in such space without needing the ultimate privacy and foe short unofficial meetings.
5. *Brain Storm Room*: directed gathering area for five to twelve persons for hearings, trainings or seminars.
6. *Meeting Point*: small space for unofficial and short term gathering for two to four persons.

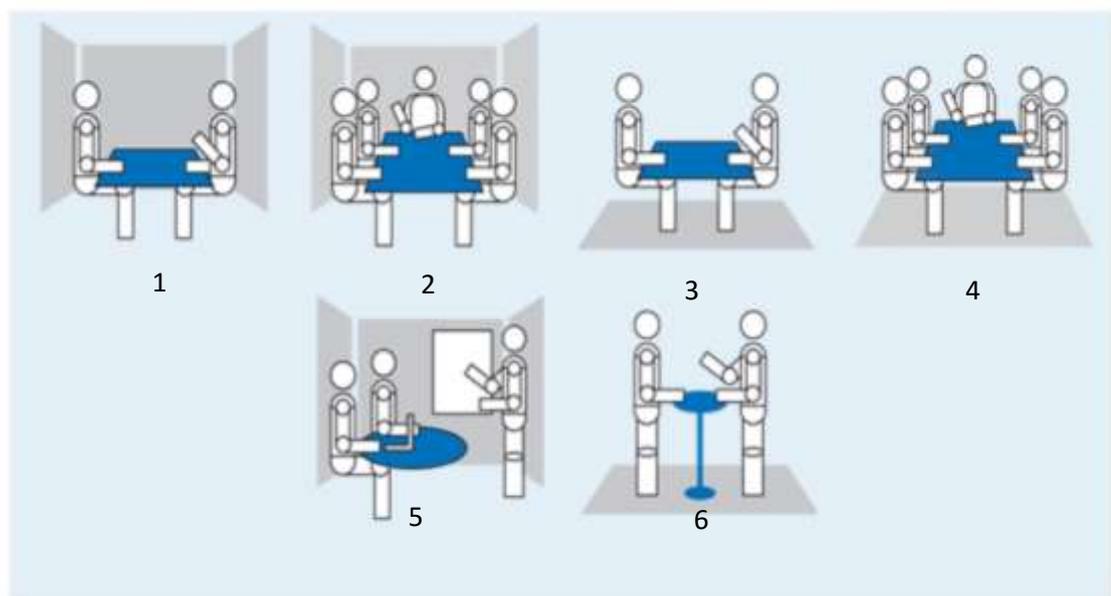


Figure 4: Meeting spaces designs within offices (Planning Office Spaces 2010).

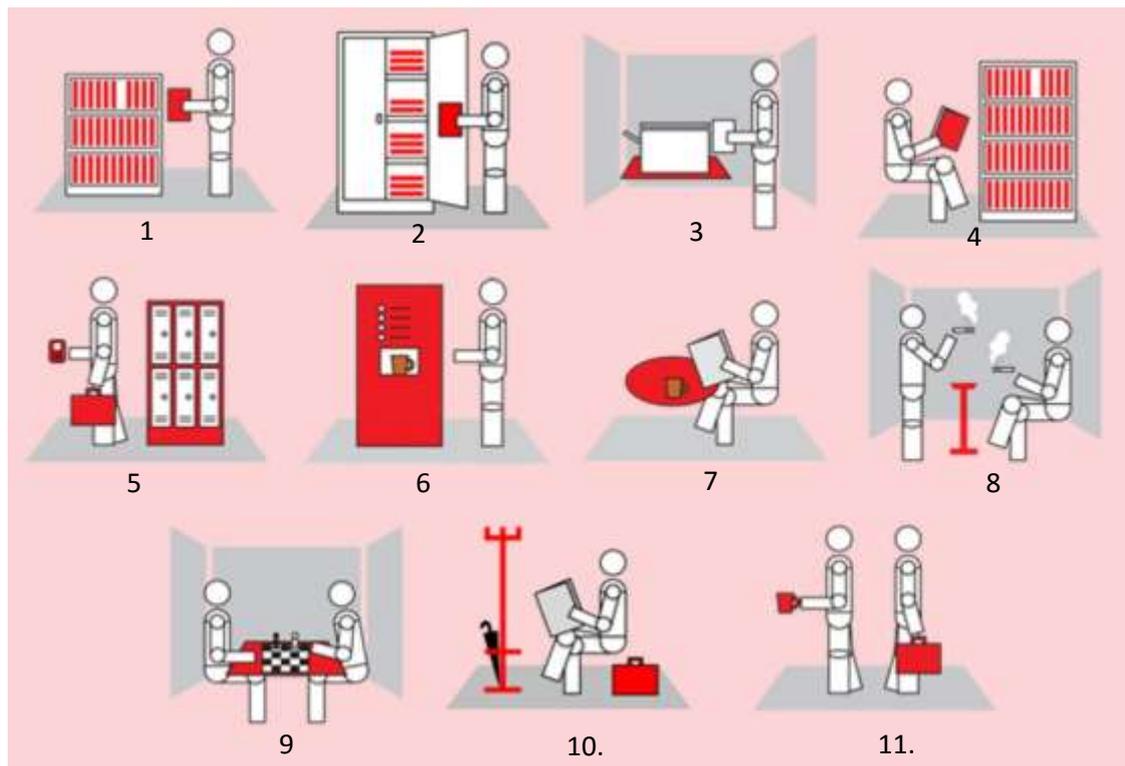


Figure 5: Support spaces designs within offices (Planning Office Spaces 2010).

Support spaces are also important to take in consideration when designing a work place for what they can provide for the employees during the working day. Planning Office Spaces Organization, proposed different layouts for support spaces of utilities as shown in figure number five;

1. *Filling Space*: used to preserve company documents and archive.
2. *Storage Space*: used for company stationary and equipment.
3. *Print and copy area*: where copying machines are located for general use.
4. *Library*: not necessary available in all offices buildings, however, some workplaces needs to provide a space for reading, writing and recitation.
5. *Locker area*: a short term storage area where employees or visitors can preserve their personal possessions.
6. *Pantry area*: a space for interaction between employees and to prepare something to drink or eat.

7. *Break area*: open space for employees to have a break during the working day.
8. *Smoking area*: to separate smokers from non-smokers within the office building and to give the smokers a place to have their break without effecting, harming or annoying others.
9. *Games room*: a semi- open space rarely available within work places and have been common in the sixties.
10. *Waiting area*: a place where employees or customers can wait their meetings within mostly open space.
11. *Circulation space*: sporadic spaces yet connected to link all offices and building utilities together.

4. Workplaces development through years

Work places have passed by different eras and centuries to have at the end a specific design for each time. Starting from holes within walls and ending up with open plan design, offices have become a must routine of our daily lives as we spent the most of the day at our work place environment. During the last century, offices have become cities' façade to other nations and one of the cultural interface for each country; it presents a great part of a nation reality, culture, economy, politics and lifestyle. Sir Cary Cooper through his human spaces report titled with *Biophilic Design in the Workplace* (2014) goes through the work places development time line starting from the 1900's till the current day. He acknowledges the modern attempt of creating restorative internal environment to offer the employees a space to be active, creative, productive and inventive, such as Google, Facebook, Apple and other companies that adopt natural concept within their internal designed workplaces.

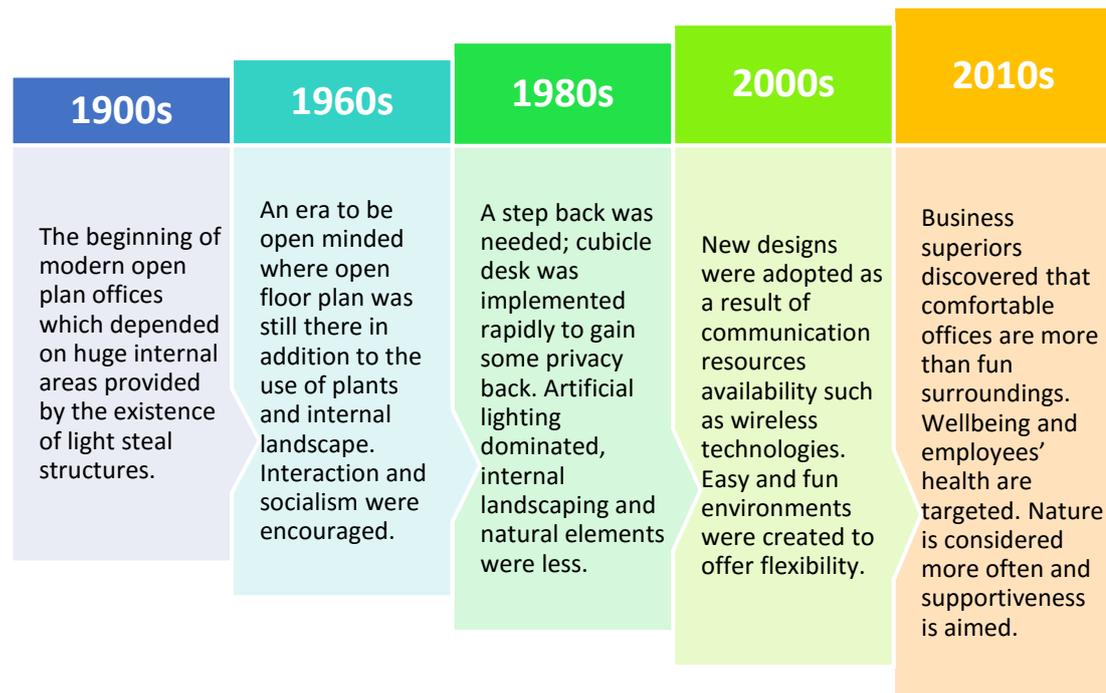


Figure 6: Work places design timeline (Cooper 2014).

5. Creating offices for functioning only by neglecting psychological, social and spiritual needs

Biophilic Design in the Workplace (2014) by Sir Cary Cooper, discussed offices design history which ended up with open plan layout. As much as open plan lay out can offer to its occupants, it also can affect their health massively if not well designed. Unfortunately, nowadays economy is the motivating engine worldwide, business owners who's usually seek less costs and more benefits, do not really give their offices design what it deserves. An open plan layout is suitable economically; less wasted area, less furniture, less internal partitions, less walls, less individual spaces and thus less mechanical equipment and materials, all that in addition to the advantage of monitoring all employees at one place while functioning during working hours. On the other hand, an open plan layout can bring up many serious issues if designed only for functioning and thus neglect psychological, physical, social and spiritual need of the space occupants. Different studies had showed that vast majority of employees are against

the open plan layout for offices; as a proof, an oil and gas company in Canada was taken as a case to study and analyse during its transformation from a classical offices layout into an open plan one, the results as *Traditional Versus Open Office Design; A Longitudinal Field Study (2002)* presents them, employees felt more stressed, fatigued, irritated, weary and their performances levels decreased.

Another survey discussing *The workplace's impact on time use and time loss* conducted by David Craig (2010) on nearly 38,000 employees found that the most distracted factor within an open floor plan is noise; people moving around, conversations, phone calls and colleagues' interruptions all affect employee's concentration, performance, memorizing data and thus productivity.

Additional two studies had discussed the effects of open plan layout noise on employees' health; the first survey *Sickness absence associated with shared and open plan offices (2011)* proved that 62% is the average of sick leaves taken by employees working within open plan offices more than other working in separate offices. The second study *Stress and open-office noise (2000)* confirmed that stress started to show on the applicants after only three hours of working within a regular open plan layout.

Figure number 7 shows the different between a classical office layout (separated offices) and an open plan layout based on analysed data from the Centre of the Built Environment at University of Sydney; it represents multiple aspects that affect employees' health the most;

- Lack of Light.
- Visual Discomfort.
- Noise Level.
- Less Sound Privacy.
- Less Space.
- Less Visual Privacy.

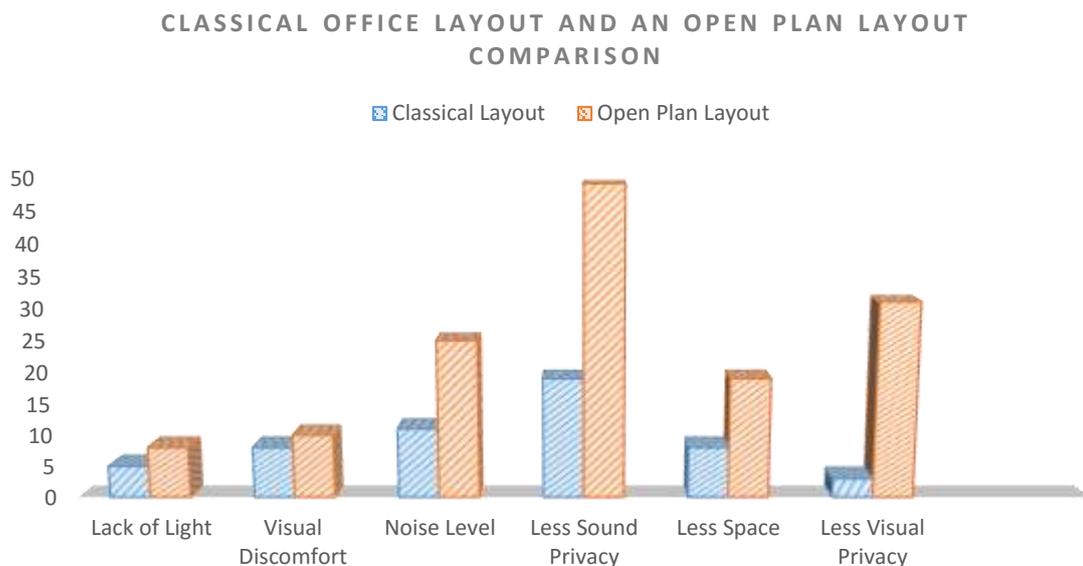


Figure 7: Classical office layout and an open plan layout comparison (SCHWARTZ 2013).

Privacy levels are the most disturbing factors within open plan layout; both visual and sound privacy not only affect the employee him/herself it also considered noise for his/her colleagues which can leave all the staff annoyed, easily irritated, psychologically discomfort and thus physically tired.

6. Summery

In conclusion, built environments do play great role in human life, and its design implementations should be taken in consideration to minimize its negative effects on human health and thus enhance buildings role positively in promoting person's health. Chapter 2 below discusses human health as a start point of achieving ideal design within workplaces for human kind.

Chapter Two

Human Health

1. Introduction

Designing an ideal built environment for human kind that can not only protect but also promote human health requires us to understand and comprehend the intended meaning of health. Chapter 2 discusses human health from different aspects such as health definition, human health parameters, Pathogenic and Salutogenic health concepts and ways to promote human health.

Examining human health and its parameters in this chapter will establish a start point from which we can know, study and analyse an individual needs within built environment generally and work places particularly, so supportive designs can be created and implemented.

2. Health definition

Phrasing a definition of human health has been a struggled progress since the early 20th century, World Health Organization had described human health in 1948 as “*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*” (BMJ 2011, p.1), however this definition didn’t find acceptance from all official and unofficial organizations, pundits’ point of view was time is changing and thus diseases, therefore health definition should change also, they also disagreed with the word “complete” since no one is completely not complaining from something, it’s very ambitious word which may not describe the reality perfectly. On the other hand, World Health Organization definition can consider a positive one since it aspires to absence of diseases, it also addresses the three main aspects in human life; Physical, mental and social, which combined the three can produce a healthy human (BMJ 2011).

In 1986, World Health Organization, during the Ottawa Charter for Health Promotion announced that Health is "*a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities.*" (Nordqvist 2015). No matter what words were used to define health; all definitions agree on the main effective aspects of human life which influence his/her life; Physical, Mental, Emotional and Spiritual. Maintaining these four aspects during human life within a balanced zone where all of them are being taking care of without overshadowing another aspect is considered the key to avoid putting human health in danger. Similarly, Dr. Andrew Weil emphasizes the same concept in his definition of health; health as he explains it is a relative state of balance between internal and external forces within the human body, if the body is healthy it can interact with germs without getting infected, with allergens without getting allergic responses and with toxins without being harmed. As he sees it; all humans have their own internal quality and it depends on them to how protect it and enhance it to keep a healthy body (Weil 2013).

3. Human health parameters

3.1 Physical health

Human health has several parameters to consider; physical, social, mental, emotional and spiritual, physical health is undoubtedly the most perceptible dimension of human health. If one is suffering from an illness whether physical or mental one, the early signs appear physically, therefore human physical status tells a lot about his/her health. Maintaining our physical health relies on our lifestyle habits whether it's healthy or not; good nutrition, getting enough rest and sleep, handling small health problems and avoiding toxins, all can consider physical health parameters. As a first step of living a healthy life, achieving physical health can reduce severe symptoms of unhealthy and uncomfortable status, which will allow human body to function as it is supposed to. Several factors affect human body physical health, as shown

in figure number 8 some are controllable and some are beyond human control; lifestyle and health care are some of the factors that a human can control and thus can prevent their dangerous; eating and sleeping well, avoiding harmful toxic materials and stressful situations in addition to a regular health check-up, all are positive health factors that human can control. On the other hand, inherited genes and external surroundings are factors that affect human physical health but yet he/she cannot control them, their effects can massively change human health, and since inherited genes are something that is beyond human consciousness, it leaves us with environmental dimension which affect physical health but yet human can take an action to prevent its harmful influences if exist. Surrounding environment and its components such as air, light, sound, landscape, built environment, cultural symbols, economy and other conditions that we are living among, can affect human physical health massively.

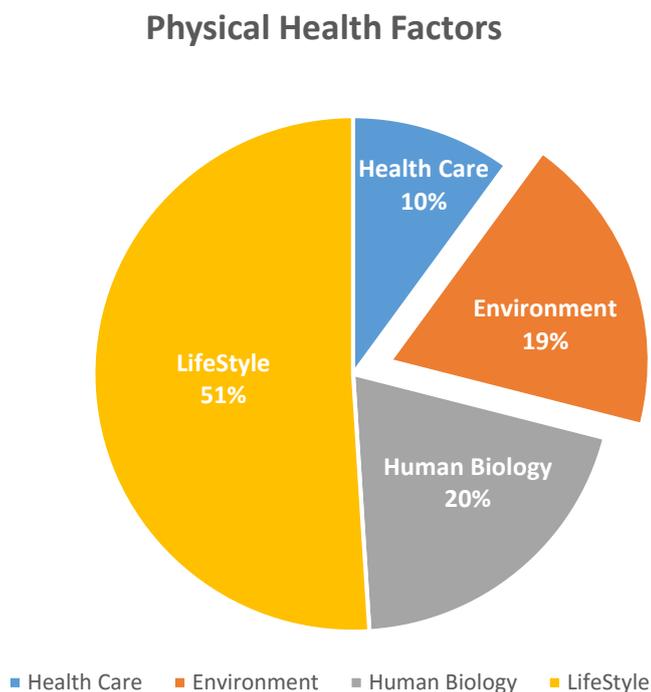


Figure 8: Factors that affect physical health (Richards 2012).

As shown in figure number eight, controllable factors that include lifestyle and health care represent 61% from the total factors that affect physical health, human biology and inherited genes represent 20%, while

19% is the percentage of environmental influences on human physical health.

Surrounding environment cannot consider as a controllable parameter, however, if some changes could be done to enhance the conditions around the person then physical health would be closer to achieve. One of the effective environment determinant is air quality, the characteristics of air that human is consuming undoubtedly affect physical health, if the air is polluted, moisturized, dry or stuffy it will leave the occupants with in the space in an uncomfortable status which can evolve to a health condition such as asthma, suffocation, coughing, chest allergy and other health problems which will weakens human body and its physical condition. Figure number 9 shows air quality levels and their effect on human health, it displays air quality index which is The AQI is “*a numeric scale that translates ambient air pollutant concentrations into consistent, recognizable values independent of the specific pollutant. The AQI is the primary measure we use to communicate the healthiness of air to the public*” (YOLO-SOLANO, n.d.). The lower the number is the better air human consume and thus better physical health.



Figure 9: Air quality index (YOLO-SOLANO, n.d.).

Another important factor that leaves great effect on physical health is light, being exposed to light for long period or on the opposite, the lack of it can cause severe health issues such as burns, vitamins' levels imbalance, stress and fatigue. For example, of the importance of light, the connection between light, body timing and hormones, where a nerve link is connecting eyes with a biological clock located in human brain, there is also another important link between eyes and a brain part that is responsible of hormones in human body. Exposing to light either natural or artificial affects many physical procedures within human body such as sleeping, body temperature, heart rate and producing hormones, where light -dark mechanism controls for example Cortisol hormone which is known as energy hormone, it also controls Melatonin the sleep hormone. In early hours of the morning, Cortisol level is usually high, it starts decreasing during the day but at the same time remains at a sufficiently high level to provide sufficient blood sugar and thus energy and alertness during the day, it then reaches the minimum level at night. On the contrary, Melatonin level is low during the day to prevent sleepiness feeling and to keep human body active and awake, and then during the day it increases till reaching its highest level at the end of the day to create a relaxed status within human body to fall asleep. Figure 10 below explains the light-dark mechanism.

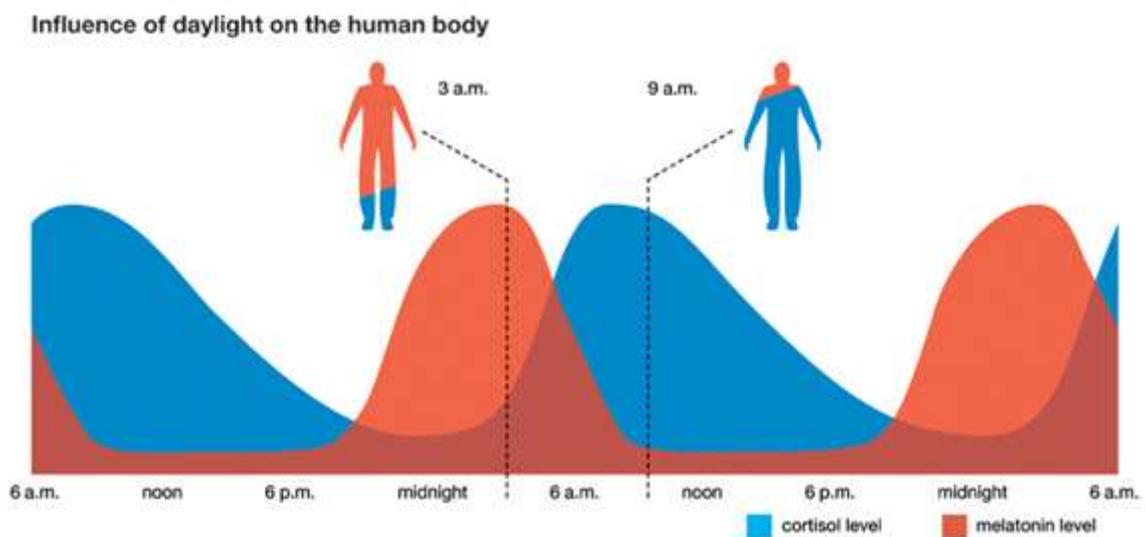


Figure 10: Light-dark mechanism effect on human body (Fergus 2015).

Clearly light plays a great role in human body physical health, on one aspect only of light effects, exposing to light affect human sleep timing and thus will for sure affect his/her health. lack of sleep can cause death if one goes ten days straight without sleeping, it also if sleeping is intermittent can cause stress, irritation, tiredness, exhaustion and aggressiveness and thus within a work place all these will affect employees' performance and production.

Sound level is also one of the factors that play a remarkable role on human physical health. When sounds levels are no longer preferable or unwanted then it's called noise, people around the world are suffering from noise on a daily basis as a result of development; traffic, construction sites, aircraft, crowdedness or media are some of the new life noisy features. Noise has great influence on human health, it can affect sleeping habits, mental status, physical reactions and other dependent issues which affect physical state. Consequently, noise also affect performance, productivity, creativity, economy and finance. The World Health Organization in Europe in 2011 analysed the cost of noise through Europe which costs 30.8 billion Dollar per year through healthcare, sick leaves days, low productivity and performance. WHO also stated that any time an employee or a worker hears someone talking near him/her, his/her productivity decreased to 66% as a result of being watery and distracted. However, when sound masking systems were installed; WHO found that workers' concentration levels increased to 46% which improved their working skills (May 2013). Figure number 11 represents the short term and long term of noise effects on human health; where two third the symptoms may end up with heart diseases in long term, in addition to the possibility of hearing loss and tinnitus. Therefore, sound levels should be considered when designing places according functions to be in the range of 85 decibels which is the average sound level that human can bear without any side effects if continued for eight hours only.

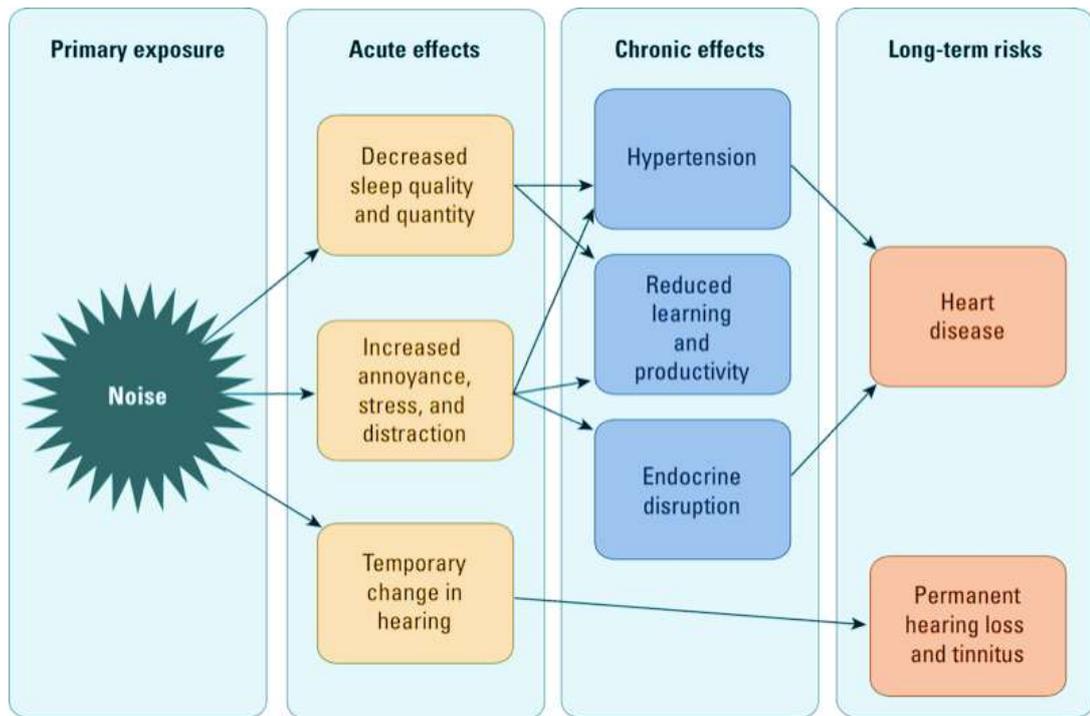


Figure 11: Noise effects on human body (EHP 2014).

As mentioned earlier, many parameters affect human physical health. In addition to the major ones; air, light and sound; there is also landscape that usually affects human physical health positively unless one is allergic to specific type of plants, also there is the whole built environment and its components such as building materials, special arrangement, furniture, equipment and technology, each has its effect on human health physically. Culture and personal concepts also affect physical health; what people believe it's good for their health not necessarily a good practice for enhancing their physical state. Economy is also one of the factors, having the financial means to provide a decent health care level and medicines in case of illness plays a main role of preserving human body healthy.

3.2 Mental health

Mental health as health in general has been defined generally without reaching a definition that can explain mental health globally since its definition depends on culture, social, conditions of life and other

factors that vary from country to another or from one environment to other. World Health organization defined mental health as ***“a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community”*** (WHO 2014). Another explaining of mental health was represented by Dr. Mike Condra Queen's University's Director of Health, Counselling & Disability Services, where in his point of view, mentally well is not less than being happy twenty-four hours a day, seven days a week, however he stated also that no one has such a happy life and human during his/her life feels happy, sad or anxious.

According to Dr. Mike, mental health can be defined through three aspects; engaging in productive activities, engaging in fulfilling relationships and human ability of adaptation.

Engaging in productive in productive activities such as reading, teaching, writing, drawing, sewing or other activities, all can engage human senses and intellect which helps him/her grow and develop, on the contrary, destructive activities may harm and hurt human health.

The second aspect to define mental health is engaging in fulfilling relationships which provide the human with strength, happy, support and help when needed. Relationships with family, friends or even acquaintances help the human to full his/her free time with productive feelings and affections.

The last and most important aspect of mental health definition is the ability of human being to adopt and change according to the surroundings variables around him/her. Human adaptation ability allows him/her to deal with situations that cause stress or difficulties, if one is mentally well he/she will have the ability of being flexible and the ability of solving problems. But if he/she is mentally unwell, he/she will start losing flexibility and will deal with all situations with same strategy or worse will avoid solving problems and run away from them.

On the other hand, mental illness is a general term used to describe a number of changes that can affect human mental health. Human thinking

can change due to mental illness, people with mental health problems sometimes have difficulties with concentrating, memorizing, attending and mood issues which affect functioning. People who suffer from mental health problems usually get more anxious, sad, irritable in addition to the feeling of losing sense of pleasure, they also may experience difficulties with eating, sleeping, talking to other people and losing interest on their personal hygiene.

Mainly mental health is associated with stress, people become unhappy when they are mentally unwell which affect their ability of functioning tasks they used to do when they were mentally well.

Figure number twelve below shows the factors that affect human mental health; biological factors, psychological factors and social factors as World Health Organization stated in their annually report; The World Health Report 2011.

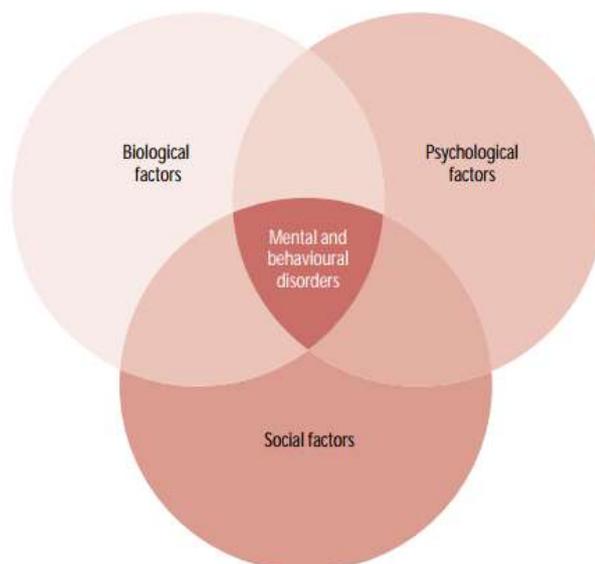


Figure 12: Factors that affect human mental health (WHO 2001).

Biological factors represent human characteristics inherited from his/her parents; mentally disordered genes can be transmitted from one's ancestors and thus cause mental disorder.

Psychological factors such as motivation, anxiety, personality, personal concepts and concentration all affect one's psychological health that affect mental health, if one is lacking motivation he/she won't be stimulated to function normally.

Finally, social factors usually include the environment that one is living, interacting, working, learning or aging in. One's perception of social factors can affect his/her interactions and behaviour towards others in addition to his/her life experiences, if these experiences were not successful they would leave great effects on one's life and may cause social and psychological distress.

3.3 Social health

One of health parameters that plays great role in human life is social health, as shown in figure number thirteen below many factors affect social health on their behalf; disability, working conditions, employment, income, social exclusion, housing, social safety net, early life and education.

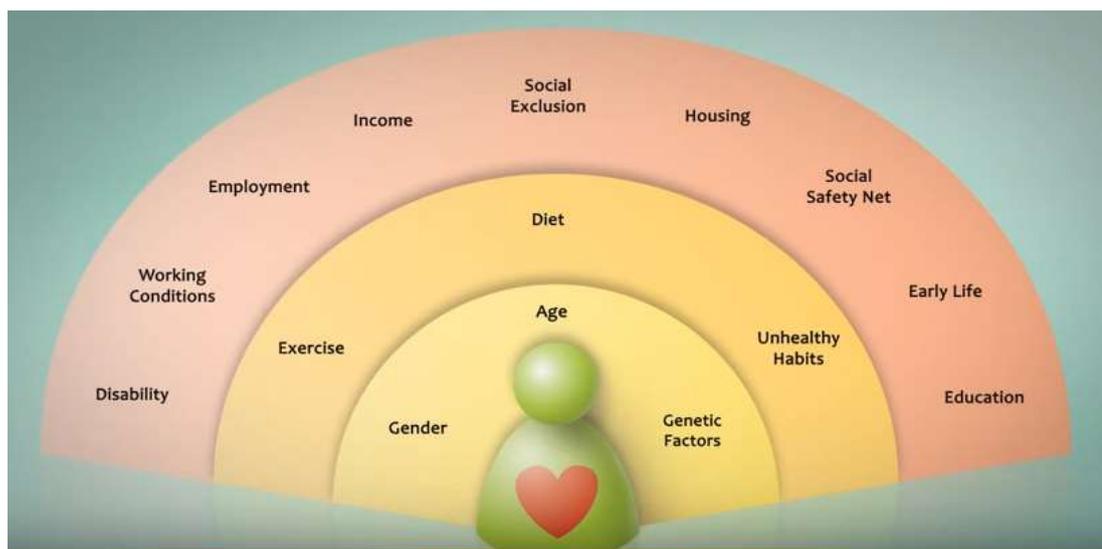


Figure 13: Social factors that affect human health (PHO 2012).

These factors affect human social health by their consequences on one's life, for example, education, employment and working conditions; all lead to determine one's income, if his/her income is within the average or less than his/her lifestyle aspects such as eating habits, housing, healthcare, dressing and education will be affected negatively and thus his/her health. another influence which forms one's social health is stressful situations, for instance, working conditions; if one's is working within uncomfortable or unhealthy workplace, then he/she will suffer from Sick Building

Syndrome symptoms which will eventually cause stress which itself can cause anxiety, insecurity, low self-esteem, social isolation and lack of control. On the other hand, social support is one of the factors that affect human health positively, having supportive relationships during life experiences can provide emotional and physical support for people when they need it, social interactions also can help building social network which can improve one's behaviour, interactions and reactions and thus improve his/her physical, mental and social health.

4. Promoting human health

World Health Organization first time to discuss human health promoting was in 1986 at the First International Conference On Health Promotion in Ottawa, where the organization identified five areas of actions to promote human health; build healthy public policy, create supportive environment, strength community action, develop personal skills and reorientation of health services as shown in figure number fourteen.

Health promoting process is global responsibility; indeed, health care sector is responsible for the biggest part of such process but meanwhile individuals, groups, organizations, communities and nations all have their own role to increase promoting health. For example, each individual is responsible for monitoring his/her lifestyle habits to improve general health. Organizations also are responsible of providing healthy, safe and comfortable environments to their members, and if they are related to health care sector then they should encourage healthy strategies and support health care sector vision and policies.

As this research addresses supportive designs and how to create psychosocially built environments likewise one of the main action areas set by World Health Organization. Creating an environment where one can feel healthy, comfortable, motivated, creative, social and enthusiastic to deal with daily life issues and people among. Such environment will encourage the occupants to express their selves, their thoughts, opinions and time with others, it will provide a space prepared with what human

individual needs; feeling safe, security and having control over his/her surroundings, in addition to feeling welcomed within the surrounding and thus confidence of his/her capabilities, talents and potentials. Within supportive environment, individual can feel the ability of accepting new challenges and set strategies to deal, analyse and solve dilemmas, he/she will have the physical, mental and social wellbeing that is needed to face life provocations.

Abraham Maslow a psychologist suggested a model of individual needs especially within work place, he divided an employee engagement to five levels; starting with survival level, he suggested that at this level the employee is working to provide for him/herself so he/she won't be unemployed, at this level also the employee can't feel satisfied or excited about the job assigned to him/her, he/she is always thinking of resigning and thus no job loyalty can be mentioned. The next level of Maslow's model is secured level where the employee does not think of resigning, however, he/she is still looking for better opportunities, counting overtime hours and planning for vacations and leaves. At this level also the employee starts recognizing the surrounding elements and working condition in addition to the physical space around his/her working places. The third level is belonging; the employee feels he/she is part of his/her company but still won't admit it, if a motivator is available the employee will offer more effort, experiences and initiative actions. At belonging level, the employee not only recognize the physical surroundings around his/her work place, he/she will step up and perform some changes his/herself as an attempt to create more comfortable and creative personal space. Fourth level is importance, the employee feels his/her importance at workplace, he/she is engaged, encouraged, enthusiastic and optimistic, at this level the employee hopes for the best and thus do his/her best to achieve settled goals and to feel harmonious with the physical, social and spiritual environment. The last level which according to Maslow only 15% of employees reach self-actualization, the employee starts thinking of developing the environment around him/her, motivating colleagues, setting an idol to others as an attempt of inspiration in addition to aspiring

to improve and enhance the performance of the organization. Figure 14 below shows Maslow's individual needs model within workplaces.

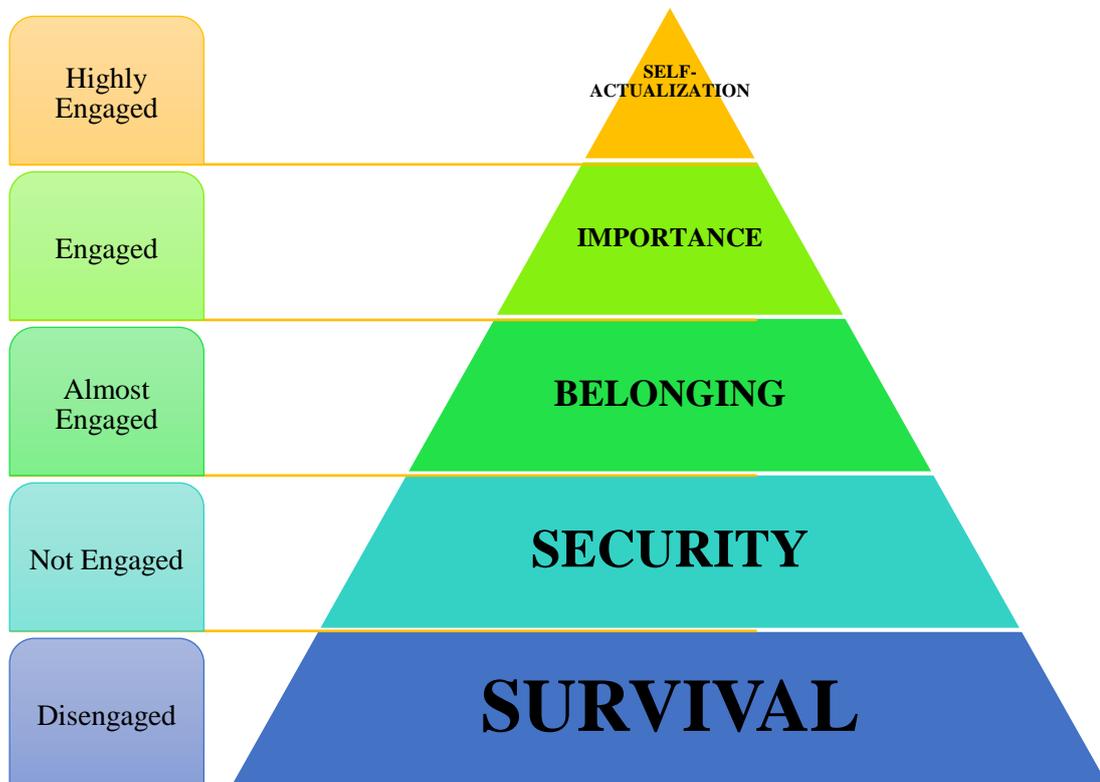


Figure 14: Maslow's individual needs model within workplaces (Smith 2014).

5. Pathogenic and Salutogenic health

A way to define health is the terms Pathogenic and Salutogenic, as Craig M. Becker explains in his video published in 2013 addresses the differences between pathogenic and salutogenic; he first explains the start point for both terms. While pathogenic start point is the disease itself and human reactions that can eliminate such problem to create health; salutogenic on the other hand sets health and human body potentials as a start point; human ambition is to achieve the ideal health status without the need to start with unhealthy one. A person attempts to keep, enhance and improve his/her health life and does not wait until a health problem occurs to start taking health in consideration. Pathogenic is about averting

problems when they occur and salutogenic is to achieve ideal human health capabilities. Another difference between both terms is their responses and way of handling human health; pathogenic is considered a reactive to human health, it waits till a problem or a disease happens then act according to that stimuli, on the contrast, salutogenic is considered proactive to human health, it creates, controls or generates better human health by causing something to happen rather than responding to disease after it has happen. Pathogenic adopt the theory which suggest that human is naturally healthy and all he/she needs is to avoid getting sick or to deal with health problem in order to return healthy, while salutogenic suggests that human health is imperfect in some way and thus he/she needs to create conditions that improve and enhance human health as an attempt to achieve the ideal health status he/she attempts to reach, therefore, pathogenic can be described as an idealistic approach when salutogenic is a realistic one since it encourage human to enhance his/her health so when he/she get sick and they will during their entire lives, they can face that health problem with minimum effects. Pathogenic is mainly about avoiding pain, getting treated and assuring not to recede, whereas salutogenic is about health improvements, moving forwards and live the healthy life that one can achieve. At the end point the difference between pathogenic and salutogenic as described by Becker is pathogenic ends when the health problem or the disease is treated while salutogenic does not really end, it keeps moving forward within progress points. Table number one attached as appendix A summarizes the differences between pathogenic and salutogenic.

Despite the differences between pathogenic and salutogenic, both concepts complement one another, salutogenic and its positive approach is what health sector is trying to study, analyse and measure in order to set a new positive health care system. Since salutogenic concept is presented by the human health potentials and promotion, its outcomes can't really be measured, they can be noticed, acknowledged and sensed but yet not measured, therefore, some measurement tools were implemented to detect salutogenic outcomes. Aaron Antonovsky an

American sociologist suggested Sense Of Coherence tool; he defined it as *" a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement."* (Wikipedia 2016). A person's sense of coherence depends on stimuluses and provocations in his/her lives and his/her reaction toward them, and their effects on his/her life, if a provocation affects persons mental, physical and social health or if it harms him/her in a way then his/her sense of coherence will be affected and thus salutogenic health. As Antonovsky suggested; Sense of Coherence has three main components; Comprehensibility, Manageability and Meaningfulness. Starting with comprehensibility which indicates to a person's ability of overview situations, analyse them, specify their aspects and then foretell different results of different scenarios. Manageability the second component addresses a person's controlling potentials and his/her ability to manage and solve problems by using the resources available during an occurred situation without feeling stressed or uncomfortable. Last component which as per Antonovsky's opinion the most important component of Sense of Coherence is Meaningfulness which addresses the person's believes in life, if he/she believed in the meaning of life and the existence of good purposes that encourage a person to act and react towards life experiences in order to reach personal satisfaction then he/she will have a continues motivations that keep him/her moving forward as per salutogenic concept emphasise.

Figure number 15 shows Coherence Dimensions that affects coherence outcomes; Rollin McCraty explains different dimensions' aspects that affect person's coherence; physical flexibility, endurance and person's strength as a start affects person's physical status that is one of coherence dimensions. Mental dimension along with its aspects such as the needed time that a person should spend to concentrate mentally on a specific task or activity, person mental resilience, his/her view to the world either

optimistic or pessimistic in addition to the ability of taking more than one opinion or concept at the same time, all these mental aspects affect the person ability of being logical and consistent. Emotional and spiritual dimensions were also addressed when studying person's sense of coherence such as having deep faith and positive acceptance of others in addition to self-directive rules and relationships improvisation (McCraty 2010, p.14).

6. Summery

As a conclusion, understanding human health concept helps us to be aware of what affects a person's health positively or negatively within indoor space, which can lead us through creating supportive built environment for human kind.

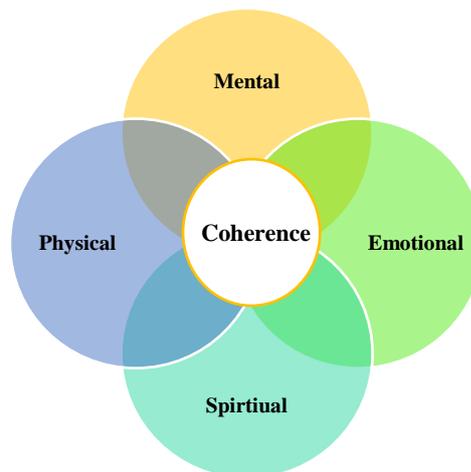


Figure 15: Coherence dimensions (McCraty, 2010).

The next chapters will discuss human health and how indoor environments, workplaces in particular can affect human health in addition to what design's theories, solutions and implementations can offer to provide psychosocially supportive environment within workplaces.

Chapter Three

Work Places and Their Effects on Human Health

1. Introduction

It is no secret that people spend most of their lifetime within indoor spaces, 80 to 90 % of person's time is spent within built environments, Gary W. Evans and Janetta Mitchell McCoy stated this statistic almost eighteen years ago in 1998, and undoubtedly people nowadays are still spending similar if not greater than this period within indoor environments. Almost two decades ago; Evans and McCoy addressed the fact that people at that time weren't acquainted with the effects of built environments on human health, they both believed that more thinking and observation is needed to highlight professionals and public awareness on buildings' effects on human life. However, after almost twenty years we can hope that people are more aware of buildings effects on human health due to some of contemporary design concepts that aim to enhance indoor environment status to meet human physical, mental, social and spiritual needs.

This chapter will discuss built environment effects (work places in particular) on human health starting with defining physical environment, Individual fundamental needs, Instability of pyramids of stress and its effects on human health and finally human ability of adaptation with his/her surroundings.

2. Physical environment

Physical environment can be defined as materials that surround a person through his/her live such as; nature, built environment, social, cultural and economic life. These three main physical aspects are considered the main components of the physical environment definition. One or more of physical environment parameters have a great effect on human health; air quality for instant plays major role on human physical health status,

nature components such as landscape promotes human health, building and their infrastructure have a great impact on people's daily lives within both short and long terms, a city culture, economy and social life have the ability to change human health for a better or worse condition (PHE, 2013).

Consequently, a person's interaction with the surrounding physical environment creates determiners that affect human health; this interaction capacity has effects on the person's character, behaviour, development and self-actualization. What information or data a person receives from the surrounding environment is what affects human reaction to external stimuli around him/her, these exciters usually need multiple phases to be completely received, analysed and memorized within human brain, which eventually leads to a selective response to the external stimuli.

Human information processing is the lead operation by which a person's reactions toward external stimuli are determined; sensation, perception and cognition are the main phases of such an operation. Sensation; the first stage of information processing procedure aims to simplify the received data by one of the human five senses from the surrounding stimuli and preparing it for next stage. Perception; the second step of information processing procedure aims to link the data collected with previous ones that were kept as memories in human brain. At perception phase, human brain does not deal with the collected data individually; however, it processes it according to memories, personality, similar previous situations, previous reactions, current parameters and whatever factor that affects human physical, social and mental responses to received data. The final phase of processing information is cognition, where human mind understands its surrounding elements and builds up enough knowledge to select a suitable action to interact (Fischl 2006, p.3).

Both second and third phases of processing information within human brain: Perception and Cognition are the connection between the inner human psychosocial drivers and the external physical environment. Each person should have the ability to process data and to be capable of taking

a suitable reaction toward external stimuli, these reactions could be displayed as stress, joy, happiness, excitement, irritation, feeling controlled or anger. What an occupant feels within the surrounding physical environment determines the space-user interaction success degree, which can give an indication of the physical space success degree. According to this space-user success degree, architects and designers should build up their designs to meet the users' perception of the space not according to their self-perception of spaces, forms and colours as experts (Fischl 2006, p.3).

3. Indoor environment effects on human health

Indoor environment quality that affects human health consists of four main parameters that influence its characteristics; Air quality, Thermal quality, Acoustical quality and Lighting quality. Each has a role in forming an indoor environment quality according to the space function.

3.1 Air quality

Most people spend their day within indoor environment, which makes them susceptible to indoor air for long periods during the day. As indoor air quality is considered the most effective parameter of an internal environment, its quality affects human health massively; 2.7 % of global diseases are caused due to poor indoor air quality. The Scientific Committee on Health and Environmental Risks (SCHER) estimated that 1.5-2 million deaths per year are related to poor indoor quality conditions. Pollutants such as gasses emissions, dust, pollens, moulds and other substances can cause some danger and chronic health problems, their sources can vary from a small piece of furniture to one of the biomass fuels.

Table 2 attached as appendix B lists indoor air quality pollutants, their sources and their effects on human health as European Lung Foundation listed in 2016.

3.2 Thermal quality

Indoor thermal quality is related to the air quality within indoor environments, its characteristics depend on several parameters, some personal and the others are environmental ones. Indoor air temperature, water vapour within air particles, air direction and air speed are some of the environmental parameters that affect indoor thermal quality. On the other hand, there are personal determiners that also affect a person's thermal comfort such as; age, gender, person's activity within the indoor space, health condition, clothing, habits, cultural background and social norms. Accordingly, indoor thermal quality is achieved when a balance status between all the parameters is accomplished.

In addition to the thermal quality determiners, a person's responses to the inner thermal conditions also affect his/her thermal comfort, these responses can be divided into behavioural responses such as changing the indoor place or the person's cloths insulation, and physiological responses in which human body reacts to the external temperatures by sweating or shivering. The main purpose of a person's responses is to reach the comfort zone of thermal quality within the indoor environment and if this comfort zone is not achieved then both comfort and health problems will occur. Indoor thermal discomfort can cause to a person stress, distraction and irritation, it can also affect mental concentration and manual work. Undoubtedly, health problems due to poor indoor thermal quality are more serious than comfort ones; heat strokes, headaches, flues, asthma, chest tightness and eye irritation. An ideal thermal quality within indoor environment where all occupants can feel comfortable completely may considered unachievable due to the various differences between individuals. Therefore, achieving a suitable thermal environment that can satisfy a great percentage of occupants can be considered a successful thermal environment. Such an environment will provide a standard thermal conditions with giving the opportunities to

its occupants to adopt easily and thus to reach a thermal comfort state (Kalz, Doreen, Pfafferott & Jens, 2014).

3.3 Acoustical quality

Indoor acoustical quality is rarely taken in consideration by designers and engineers in comparison with air and thermal quality. HVAC system noise, lack of speech privacy, equipment noise and people movements around the internal space all can consider noise sources that affect indoor acoustical quality. As indoor thermal and air quality, acoustical quality has its effect on a person's comfort level and health condition; occupants' acoustical satisfaction depends mainly on his/her satisfaction with noise level and sound privacy level especially within a workplace where acoustical quality effects are distinctly noticeable.

Acoustical comfort level within indoor environment has its great effects on a person's psychological state; lacking to speech privacy and having the feeling that there is someone who's overhearing the person's conversation, can leave him/her irritated, annoyed or even angry, it can also create a paranoia condition which eventually will affect the person's social relationships with his/her colleagues and thus performance and productivity. Another factor that surly can affect an occupant's comfort level is noise level within indoor spaces, as figure number 16 shows sounds levels varies from 10 dB till 130 dB of bearable levels that human ear can hear without getting completely damaged, and as the chart shows the suitable sound level for offices is 50 dB. As a consequence of increased sound levels within workplaces, noise will not only distract the employees' attention of their tasks but it will also affect their responses and social interactions with others in addition to being easily irritated and provoked (Bhanap 2013).

Furthermore, noise clearly has its effects on human health including stress which by itself has great negative influences on human physical and mental health, headache, hearing problems and psychological relapse.

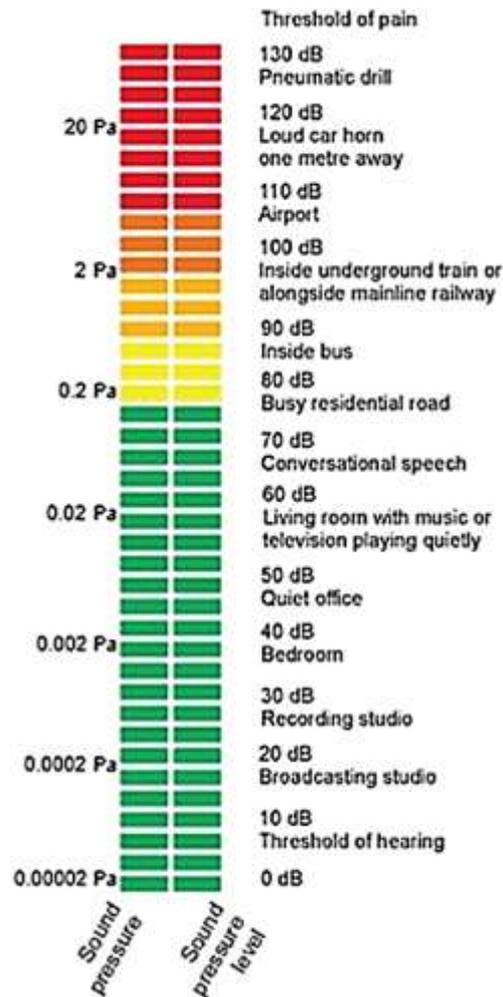


Figure 16 : A standard noise chart equating the loudness of different environmental sounds in terms of decibels (Indraneel Bhanap 2013).

3.4 Lighting quality

Lighting quality can be defined according to the factors that affect it; mainly individuals and their backgrounds have the greatest influence on lighting comfort level, a person who lives in a village has a different comfort level from an employee working at an office. Individual characteristics also have their effect on the preferable lighting level such as a person’s age, gender, health condition and metabolic rate. Activities within indoor spaces have their effects as well, lighting level needed for reading is different from sporting, cooking, presenting, sleeping, entertaining and so on. Achieving an ideal indoor lighting quality depends on visual aspects which can be divided into visual performance and visual comfort. “Visual performance is defined by the speed and accuracy of performing a visual task” (CIE 1987), which means

providing conditions where enough luminous is provided to achieve a comfortable visual environment, usually more luminous means better visual performance till luminous level reaches visibility threshold in which discomfort occurs. Visual performance concerned also with visual target size, contrast and observer age.

On the other hand, visual comfort, depends more on the characteristics of light itself such as colour characteristics whether it's warm or cold colour and how it effects the occupant and his/her indoor activities. Uniformity of lighting and the light distribution within the indoor space and the possibility of concentrating the light according to the space function. Another factor that affect visual comfort massively is glare which can be caused due to the existence of bright light sources, luminaries, windows or other bright surfaces. Veiling reflection is a factor that can cause visual discomfort status within a space, it is created due to surfaces characteristics and its angles with the space user and the lighting source. Finally, shadows within indoor space may cause visual discomfort, however, it can be a positive factor according to the internal space function, shadows can be used as a source of entertaining and attraction. Therefore, it's clear that the excessive conditions and numbers of these factors can create a visual discomfort.

In general, lighting quality within indoor environment does affect users' perception, body response and state of mind, which as a result affect performance and thus productivity. As Virgil D. Gligor an electrical and computer engineering summarized in his thesis *Luminous environment and productivity at workplaces*, lighting quality affect; Acceptability & Satisfaction, Visual Acuity, Visual & Task Performance, Arousal, Social Interaction & Communication, Mood Effects, Aesthetic Judgment, Visual Comfort, Preferences, Eyestrain, Circadian Rhythm, Seasonal Affective Disorders and Ageing (Wikipedia).

4. Human adaptability

Human ability of adapting to his/her surroundings is created due to the individual fundamental needs, a person adapts with the environment

mainly to fulfil his/her need of being free, in control of his/her state within the environment and to feel safe. In addition to the main need of feeling comfortable within the indoor environment, where a person tries to fit the internal environment datum with his/her personal requirements. Human adaptation process can be achieved through adjustment, habituation and acclimatization as shown in figure number 17.

Human adaptation can be achieved through adjustment processes; behavioural, physiological, and psychological adjustments, Behavioural adjustments can be defined within three aspects; *“Personal adjustments e.g. changing personal variables like clothing, activity etc. and adjusting to the surroundings. Technological adjustments e.g. modifying the surroundings themselves like turning on fans or opening or closing of windows etc. Cultural adjustments, which include scheduling activities or adapting, dress codes etc”* (Tiwaril, Pandey & Sharma 2010, p.91). While physiological adjustments are displayed within the person reactions to the internal surroundings, *“These adjustments can be sub categorized: Genetic adaptation, including alterations, which become part of the genetic heritage of an individual. Acclimatization includes changes in the settings of the physiological thermoregulation system over a period of time. Physiological acclimatization is mediated by the autonomic nervous system and directly affects the physiological thermoregulation set points.”* (Tiwaril, Pandey & Sharma 2010, p.91). Finally, *“Psychological adjustments refer to perceptual adaptation and encompass the effects of cognitive and cultural variables and describe the extent to which habituation and expectation alter one’s perception of and reaction to sensory information due to past experiences and expectations”* (Tiwaril, Pandey & Sharma 2010, p.91).



Figure 17: The three components of adaptation to indoor climate (Tiwaril, Pandey & Sharma, 2010).

On the other hand, when a person could not adapt to his/her surrounding, then a different body responses occur and thus new physical, psychological and social reactions take a place as an alternative attempt to adapt with the dynamic environment around. Stress is one of human body's alternative adaptation method that help the individual cope with any surrounding provocation.

5. Instability of stress

Stress can be defined as series of physical, psychological and social reactions by which an individual can react to a provocation occurred with in the surrounding internal environment. A stressful state usually caused due to both individual and environmental reasons; a person's age, gender, personal concepts, educational level, past life experiences, childhood memories, health conditions and more of similar factors, all can affect an individual final response to an existing provocation. Whereas, environmental factors usually relate to culture, religion, family, people, nature, economy in addition to materialistic aspects and any element that demand an interaction from the individual.

An individual-environment-behaviour model has been created starting with Egon Brunswik's in 1956, and ending with Geza Fischl's in 2004 (Fischl, 2006). The individual-environment-behaviour model explains stress life cycle which begin with the person's ability in addition to the environmental demands to face a provoking process. What an individual offers through the process to overcome the provocation defined as actual capability, whereas what the environment can offer for overcome the same provocation is defined as actual demand. The individual-environment-behaviour model works as a stress measurement tool that can determine whether the person can cope with the surrounding provocations or not. Consequently, if the individual actual capability can overcome the surrounding stimuli, then stress level won't be reached and thus the person will achieve an inner state of balance where he/she can carry on normally, in such cases, the actual demand is within the

individual ideal amplitude of provocation, so his/her health will not be affected. On the contrary, if the surrounding provocations exceeded the individual actual capability, then a state of inner imponderable will occur to motivate the human body to start a series of mental, physical and social responses so he/she can manage to adapt with the surrounding and reach the balance level. Consequently, if coping process is successful then the individual can adapt or adjust him/herself with the surrounding to reach the comfort level, while if the coping process isn't successful, the human body will continue its alertness state which will increase stress level and will leave major after effects such as health problems, lack of self-contentment, low performance, low productivity, frustration which all can affect human wellbeing (Fischl 2006, p.7).

6. Summery

In conclusion and as this chapter shows, both human capabilities and surrounding environment affect the individual comfort level within an internal space, which also affect his/her health condition, performance and productivity. Undoubtedly, workplaces can be a great source of stress and tension, and as shown in figure number 18 attached as appendix C overcoming stress level individually represent half of the solution, while overcoming stressed situations by the individual capabilities and the surrounding environment is considered the ideal settlement. So, if the designers, architects and engineers were able of reducing the surrounding environmental demands by well-designed internal spaces, then almost 50% of adapting process is achieved.

Chapter Four

Methodology, Analysis and Results.

1. Introduction

The applied methodology for this research was chosen according to the subject attribute that depends on people experiences and opinions, one can't measure the supportiveness level within an internal environment by using measurement devices and experiments, such information is collected by people experiences, opinions, facts, attitudes and future expectations. Therefore, survey is the chosen method to collect the needed data since it's the suitable methodology by which this research can achieve its main purposes.

For this research, 110 persons were given the questionnaire to provide facts out of their reality and daily experiences. The questionnaire discussed the participants' work environment through two aspects; the first aspect represents their current work environments while the second one expresses the preferred work environment that each participant believes it's the ideal working environment to achieve his/her maximum efficiency.

The questionnaire discussed several parameters that have the ability to affect the employees' perception at their work environment with taking inconsideration the differences between each participant such as; age, gender, nationality, work designation and their company sector. Appendix D shows the English version of the questionnaire that was distributed among the employees, accordingly tables from 3 till 7 display some basic information collected from the participants and analysed by using IBM SPSS Statistics Data Editor software.

Table 1: Participants' gender figures (SPSS, 2016).

Gender	
Male	41
Female	69
Total	110

Table 2: Participants' age categories (SPSS, 2016).

Gender * Age							
Count							
		Age – Years					Total
		20-30	30-40	40-50	50-60	Above-60	
Gender	Male	18	15	6	0	2	41
	Female	36	14	11	4	4	69
Total		54	29	17	4	6	110

Table 3: Participants' nationalities categories (SPSS, 2016).

Gender * Nationality					
Count					
		Nationality			Total
		Local	Arabs	Foreign	
Gender	Male	0	34	7	41
	Female	10	51	8	69
Total		10	85	15	110

Table 4: Participants' work sector categories (SPSS, 2016).

Gender * Sector				
Count				
		Sector		Total
		Private-Sector	Semi-Governmental	
Gender	Male	21	20	41
	Female	51	18	69
Total		72	38	110

Table 5: Participants' work designation categories (SPSS, 2016).

Gender * Designation				
Count				
		Designation		Total
		Manger	Officer	
Gender	Male	16	25	41
	Female	13	56	69
Total		29	81	110

As shown in tables above, the questionnaire was conducted among 110 employees from different companies to ensure diversity, 41 of the participants were males and the rest 69 were females, they were all adults between 20 till above 60 years old. Their nationalities were divided into three categories; locals, Arabs and foreigners to take their cultural background in consideration since it's considered one of the parameters that can affect a person's comfort level within internal environment same as age and gender. Participants' work sectors and designations were also counted; 72 participants are private companies' employees while the remaining 38 are semi-governmental employees, in both sectors 29 employees are serving in management positions, and 81 are officers including but not limited to; designers, secretaries, accountants, supervisors, customer service employees, junior engineers, call centre employees and human resources assistants.

The questionnaire also addressed main internal elements that affect a person's level of comfort within an internal environment; data were collected, analysed and compared by the IBM SPSS Statistics Data Editor software regarding the participants 'companies' locations, the traffic around, their office distribution inside, their setting direction and desks background, their offices' furniture materials, the offices' wall finishes, colours, the availability of wall openings, the floor materials, natural elements within the office space, work places lighting, accessibility to technology, different utilities and social interaction areas and finally the possibility of a crowded space.

Furthermore, five questions were added to estimate the employees' satisfaction from their point of view regarding; their privacy during the working day, the noise levels within the work environment, internal lighting comfort level, the offices thermal and air quality and finally the stress level that each employee is facing due to the internal work environment conditions.

2. Analysing the questionnaire parameters

2.1 Work place location

One of the parameters that affect a person's stress level within his/her work places is the company location, spending nearly eight hours a day if not more in a work place that suffers from overcrowding, construction sites' noises, traffic around or even heat island effect with the lack of restorative areas, can have a negative effect on human health. Therefore, as an attempt to estimate the effect of the company location on employees' health, the questionnaire divided the participants' workplaces into two main options; city centre and suburbs. According to the numbers given by the participants (shown in table number 8), almost 73% from 30 persons who found their work places a stressful and unhealthy surrounding are working in city centres, while almost 27% of the same 30 participants are working in suburbs areas. Which indicates that there is a relationship between a person's work location and the level of stress he/she is facing during working hours. Figure number 19 shows the increasing numbers of stressed cases in the city centre in comparison with suburbs areas.

Table 6: Participants' stress levels according to their work place location (SPSS, 2016).

Location * Stress Level Cross Tabulation						
Count						
		Stress Level				Total
		Comfortable surrounding	Stressful surrounding few days a year	Stressful surrounding most of the year	Stressful and unhealthy surrounding	
Location	City Centre	4	19	29	22	62
	Suburb	4	7	17	8	48
Total		8	26	46	30	110

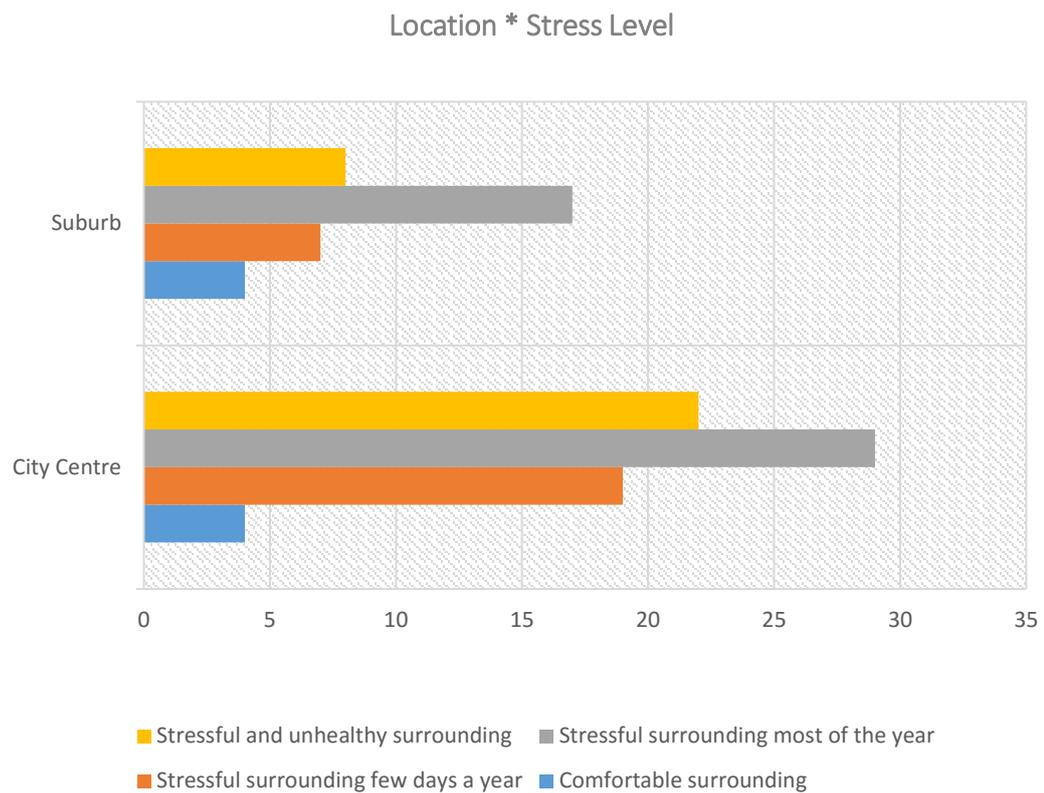


Figure 18: Stress levels differences between city centres and suburbs (Author, 2016).

Another work place parameter that can affect stress level of a person and at the same time is related to the work place location is traffic. It is no secret that facing traffic is a stressful situation, many of the questionnaire participants who works in city centres expressed their frustration of traffic around their office. As shown in table number 9 nearly 76% of city centres employees are suffering from traffic around their work places. Such a situation does not affect your arrival and leaving time only, it has its effect on your health, attitudes and activities all day long, if one is facing a regular traffic situation on a daily basis, he/she will be stressed even before starting his/her assigned tasks, such people will be easily irritated and may suffer from a headache at the early morning which can affect his/her performance, productivity and social activities. Similarly, if a person will leave his/her work place to face the traffic around it, he/she will end his/her working day as he/she started it, stressed, frustrated, annoyed and thus his social and personal life will be affected.

Table 7: Traffic around participants' work places (SPSS, 2016).

Location * Traffic Cross Tabulation				
Count				
		Traffic		Total
		Traffic	No-Traffic	
Location	City Centre	47	15	62
	Suburb	20	28	48
Total		67	43	110

On the contrary, of numbers and figures shown above when participants were asked what is the preferable location to work in, 56% preferred working in city centres while 44% preferred suburbs as long as traffic does not exist around the location. Tables 10 and 11 show the preferred locations of the questionnaire participants where 73% do not prefer the traffic around their workplaces, however, there is a small category which represents 27% of participants who preferred the continues movements around their work places and the active surrounding.

Table 8: Participants preferred work places locations (SPSS, 2016).

Gender * Location Cross Tabulation				
Count				
		Location		Total
		City Centre	Suburb	
Gender	Male	20	21	41
	Female	42	27	69
Total		62	48	110

Table 9: Participants preferable of surrounding traffic (SPSS, 2016).

Gender * Traffic Cross Tabulation				
Count				
		Traffic		Total
		Traffic	No-Traffic	
Gender	Male	11	30	41
	Female	19	50	69
Total		30	80	110

2.2 Office layout

A work place layout plan has great effects on employees' stress level in their work places, usually the common distribution layouts of employees desks are either open space offices or separate offices. Separate offices used to be the dominant layout for work places till the early years of the twentieth century when open space layout emerged and continued to be the most applied distribution layout till the present day. The many differences between the two layouts control the stress levels that an employee can face during his/her working hours, several internal parameters are affected by the employees' desks distribution such as; lighting, acoustics, internal temperatures, air quality and privacy. All these parameters were considered in the questionnaire conducted where 89% of the participants are working in open space layout, whereas 11% only have their own private offices as shown in table number 12.

Table 10: Participants' offices layouts (SPSS, 2016).

Gender * Offices Distribution Cross Tabulation				
Count				
		Offices Distribution		Total
		Open-Layout	Private-Office	
Gender	Male	39	2	41
	Female	59	10	69
Total		98	12	110

Furthermore, when the participants' stress levels were estimated; results showed that 100% of participants who find their work places a stressful and unhealthy are all working within open layout offices, while the ones who feel comfortable at their work places, have their own separate offices as shown in table number 13. Which indicates to a positive relation between the open space layout and the increment in stress level as displayed in figure number 20.

Table 11: Participants' stress levels according to their work place layout (SPSS, 2016).

Offices Distribution * Stress Level Cross Tabulation						
Count		Stress Level				Total
		Comfortable surrounding	Stressful surrounding few days a year	Stressful surrounding most of the year	Stressful and unhealthy surrounding	
Offices	Open-Layout	0	22	46	30	98
Distributio	Private-Office	8	4	0	0	12
n						
Total		8	26	46	30	110

Offices Distribution * Stress Level

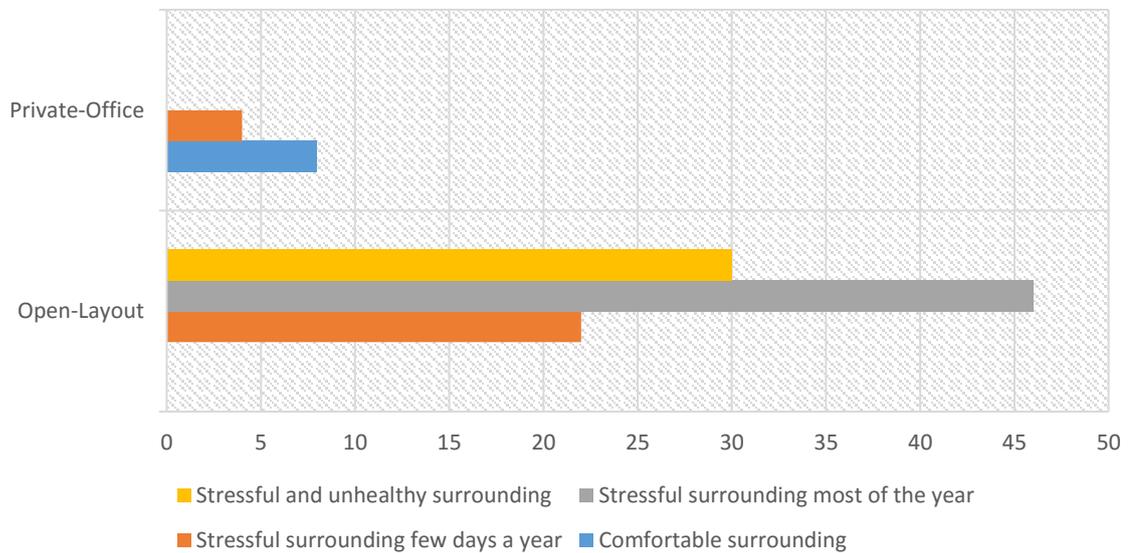


Figure 19: Stress levels differences between private offices and open layout (Author, 2016).

In contrast with the current situations, when the participants were asked which layout they wish to work in and in which they can achieve their maximum performance and productivity; 67% nominated private offices while the 33% preferred the open space layout as shown in table number 14. The 67% expressed their separate offices preference due to the uncomfortable conditions they are facing within their current open space layout such as; lack of privacy, colleagues' conversation, phone ringing, equipment noise, continues movement around the employees, light distribution and HVAC system distribution, all can affect an employee

comfort level. On the other hand, 33% of the participants voted for the open space layout hence they prefer a social active working place that enhances their communication skills and relationships with colleagues.

Table 12: Participants' preference regarding their work place layout (SPSS, 2016).

Gender * Offices Distribution Cross Tabulation				
Count				
		Offices Distribution		Total
		Open-Layout	Private-Office	
Gender	Male	9	32	41
	Female	27	42	69
Total		36	74	110

Tables 13-18: The relationship between work places' layout and internal comfort factors (SPSS, 2016).

Figures number 21 and 22 show the relationship between work places' layout and internal comfort factors that affects employees stress levels such as; privacy, acoustics, lighting, air and thermal quality which are created according to calculated data given by the questionnaire's participants as shown in tables 15-18.

Offices Distribution * Privacy Satisfaction Cross Tabulation			
	Privacy is achieved	Privacy isn't available all the time	No privacy at all
Open-Layout	0	33	65
Private-Office	10	2	0

Offices Distribution * Acoustical Satisfaction Cross Tabulation			
	Quite surrounding	Noise can be handled	Annoying surrounding
Open-Layout	6	35	57
Private-Office	10	2	0

Offices Distribution * Lighting Satisfaction Cross Tabulation			
	Efficient light	Enough lighting	Annoying light
Open-Layout	0	77	21
Private-Office	8	4	0

Offices Distribution * Thermal and Air Satisfaction Cross Tabulation			
	Efficient thermal and air quality	Suitable thermal and air quality	Annoying thermal and air quality
Open-Layout	0	68	30
Private-Office	10	2	0

Separate Office * Internal Comfort Levels

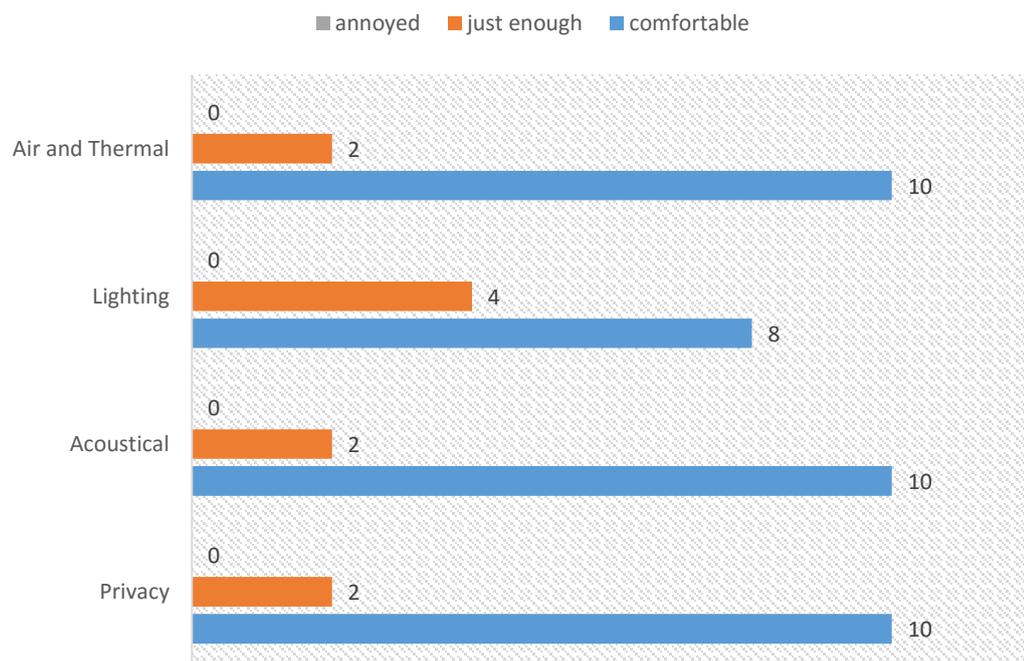


Figure 20: The relationship between separate offices and internal comfort factors (SPSS, 2016).

Open Space Layout * Internal Comfort Levels

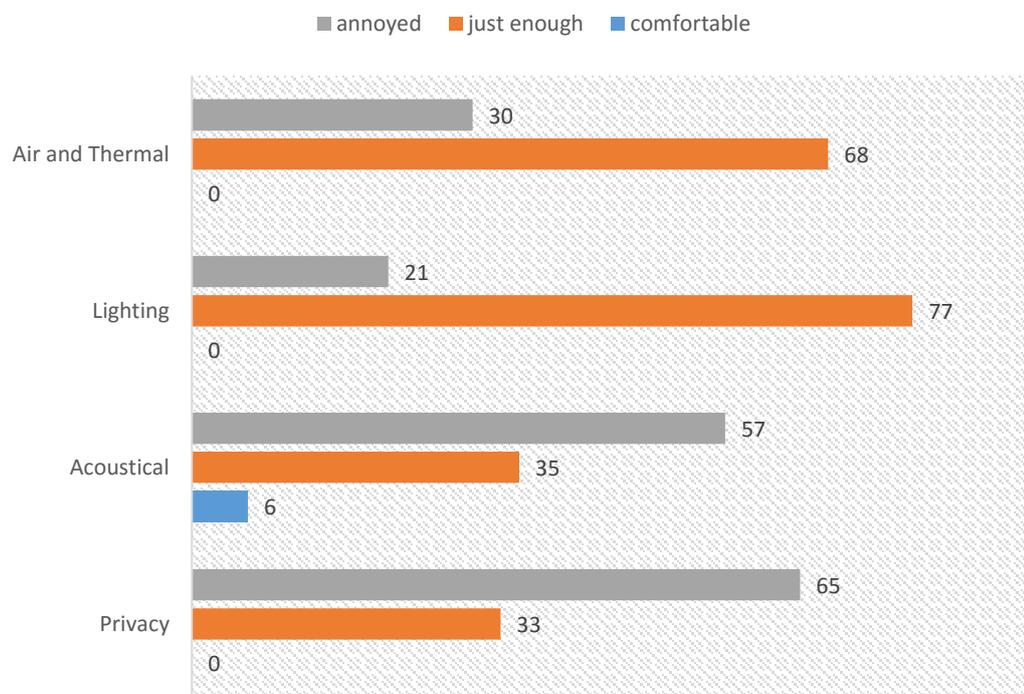


Figure 21: The relationship between open space offices and internal comfort factors (SPSS, 2016).

2.3 Employee's desk position

The employee's desk position within work places can affect concentration's level, having distraction elements while working will influence the employees' performance and thus productivity. The questionnaire participants were asked about their desks' positions in their work places and what position they may prefer, figures number 23 and 24 show the current participants' desks positions including their desks directions and their desks backgrounds. The employees' desks directions were divided into four cases; facing a wall, facing a colleague, facing a window and facing a movement area since all of them can affect the employees' concentration. For instance, facing a wall won't be as distractive as facing a movement area or a colleague, however, it can be considered a depressing element that may affect the employees' psychological state negatively, while facing a window for an example will connect the employee with nature outside which will enhance his/her perception, psychology and attitude during the day. As well as desk direction; desk background does effect the employee's perception and psychology, therefore it was also divided into; leaning on wall or window and heading a colleague or a movement area. Generally, a person won't feel comfortable where his/her moves are being watched, therefore, having a colleague or a movement area behind the employee, will create a psychological and mental state that his/her privacy is being violated, in addition to the movement noise around his/her office which will disturb concentration and comfort levels. Figures and tables below show the relationships between the current desks positions and stress that employees are feeling while working. The interesting fact is that facing or heading a colleague is the most stressful position for employees' desks, almost 33% of employees who are facing or sitting in front of other employee are suffering from stress most of the year, which can be related to the privacy violation feeling in addition to colleagues' noise within the office.

Desks' Directions

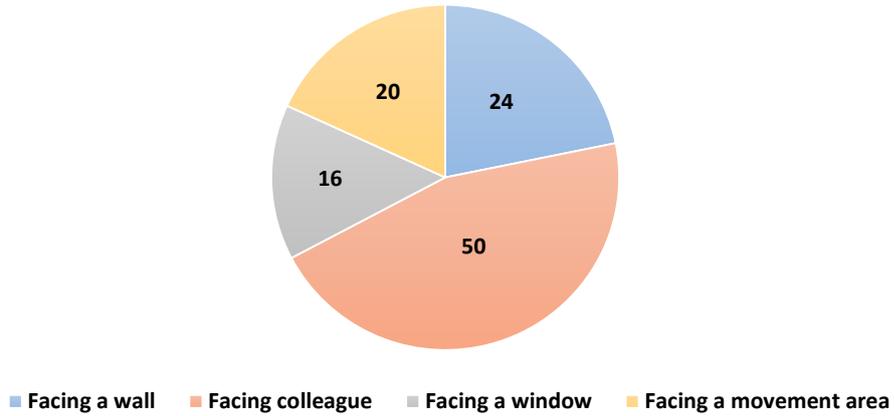


Figure 22: Current participants' desks' directions (Author, 2016).

Table 19: Current participants' desks directions and stress levels (SPSS, 2016).

<u>Stress Level</u>	Facing a Wall	Facing Colleague	Facing a Window	Facing Movement area
Comfortable surrounding	6	0	0	2
Stressful surrounding few days a year	0	9	7	10
Stressful surrounding most of the year	6	<u>31</u>	4	5
Stressful and unhealthy surrounding	<u>12</u>	<u>10</u>	5	3

Desks' Backgrounds

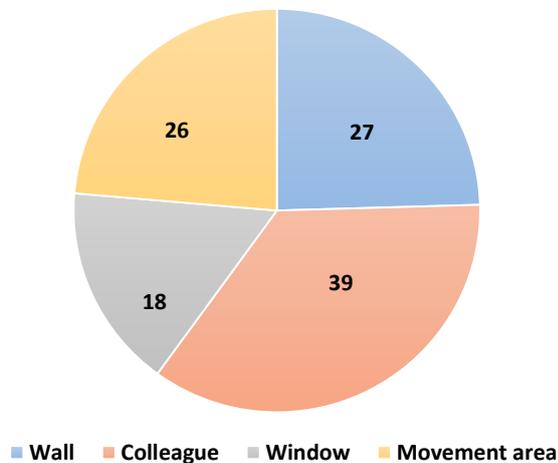


Figure 23: Current participants' desks' backgrounds (Author, 2016).

Table 20: Current participants' desks backgrounds and stress levels (SPSS, 2016).

<u>Stress Level</u>	Wall	Colleague	Window	Movement-Area
Comfortable surrounding	8	0	0	0
Stressful surrounding few days a year	10	0	10	6
Stressful surrounding most of the year	0	<u>20</u>	8	<u>18</u>
Stressful and unhealthy surrounding	9	<u>19</u>	0	2

Furthermore, when participants were asked what desk position they prefer, 84% prefer facing a window for their desks' directions, 49% prefer leaning on a wall and 45% prefer having a window behind their desks as shown in tables below.

Table 21: Preferred desks directions (SPSS, 2016).

Desk Direction * All Participants Cross Tabulation	
Desk Direction	All Participants
Facing a Wall	13
Facing Colleague	2
Facing a Window	93
Facing a Movement area	2

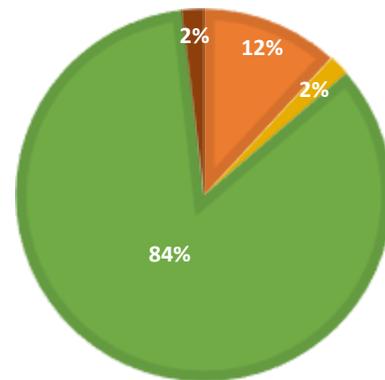


Figure 24: Preferred desks directions by percentage (Author, 2016).

Table 22: Preferred desks backgrounds (SPSS, 2016).

Desk Background * All Participants Cross Tabulation	
Desk Background	All Participants
Wall	54
Colleague	6
Window	50
Movement-Area	0

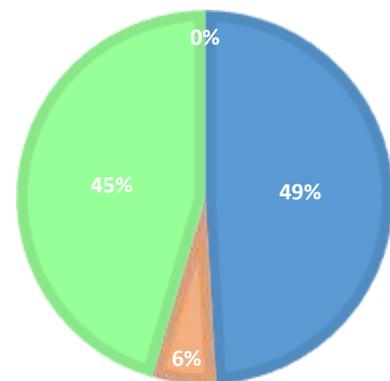


Figure 25: Preferred desks backgrounds by percentage (Author, 2016).

2.4 Work place materials and colours

There is no doubt that a space materials and colours play magnificent part in occupants' psychological states, what a space user is receiving from the surrounding internal components such as colours, building materials, finishing materials and furniture shapes, can encourage his/her perception to react differently to occurred situations. Internal materials and colours not only affect the user's reactions, it also affect the user's mental, psychological and physical health, for instance, some building materials can cause severe problems to human health especially if the user is spending most of his/her day within the harmful internal space. Asbestos is one of the building materials that is considered a good example of dangerous building materials on human health; it was rapidly used at the end of 19th century, yet its dangerous effects were not noticed until the 20th century, which ended up with prohibition through many countries. Using asbestos within building materials can cause serious health conditions such as lung cancer, mesothelioma, coughing and other breathing problems, which at the end can cause death, therefore, building materials used, can affect human health massively (WebMD, 2014).

Likewise, colours also affect human health; however, its effects may be less dangerous than building materials yet should be taken inconsideration. If applied carefully, colours can affect employees' attitudes, creativity, moods, performance and thus productivity; they also can express the internal spaces aesthetics. In any internal space, designed colours within furniture, walls, lighting or floors should be considered an integral process, employees' perception is affected by colours when it comes to size and internal space appearance; "Certain colors may make a space appear larger than it actually is, while others cause spaces to appear smaller. • Certain colors may cause a space to seem warm, while others may make it seem cold. • Colors have a definite effect on the mood of the observer. Some colors are stimulating, others are relaxing. • Colors that clash with each other may produce feelings of irritation or uneasiness" (Alaska Indigenous 2012).

The questionnaire's participants expressed their opinions regarding materials and colours used at their work places. Almost 87% of them preferred wooden furniture at their work places, at the same time they excluded the wooden walls and floors considering their dark colours and noise in an active internal space. Therefore, wood is preferred to be used within the internal environment to give the occupants a sense of being connected to the nature by a piece of furniture or a part of a wall without feeling overwhelmed.

Unanimously, the participants preferred having light colours within their work places especially the walls painting colours due to the spacious feeling they can sense in addition to calmness and activeness. They also preferred having painted walls as walls finishes over glazed and wooden walls mainly to increase their privacy comfort level, while 61% of them preferred the painted walls, the remaining 49% was divided into glazed partitions as long as the glazed walls are not installed at their desk background, in addition to wooden walls which are not preferable.

Regarding floor finishes, marble is the preferable floor material mainly for its aesthetic and cooling effects since it is a natural material that can help low the room temperate in hot climate. In comparison with hardwood, carpet and rubber 77% of participants chose marble finishing; hardwood was excluded due to noise factor, while carpet and rubber flooring were welcomed by 17% only.

In conclusion, employees did not prefer vociferous colours, noisy flooring and metal furniture due to their stressful effects on employees' psychological and mental states. On the other hand, light colours, wooden furniture and marble floors were employees' preferable since they somehow create a sense of connection with nature which have a calming effect on human health; they also encourage the creativity and stimulate employees' performance that can improve their productivity.

2.5 Wall openings and natural elements

Having a connection with the surrounding nature was one of the questionnaire parameters to discuss with employees; wall openings and the availability of natural elements within the work place are the common ways to connect the internal environment with the external one. As shown in table number 23 which displays the current situation of wall openings and natural elements availability within workplaces; 31% of the participants have windows at their offices, while 69% are working with literary a box where wall openings are not available. Similarly, table number 24 shows that 85% of employees do not have any kind of natural elements at their offices while the remaining 15% have plants.

Table 23: Wall openings current situation (SPSS, 2016).

Walls Openings Cross Tabulation		
Walls Openings		Total
With Wall Openings	No Wall Openings	
34	76	110

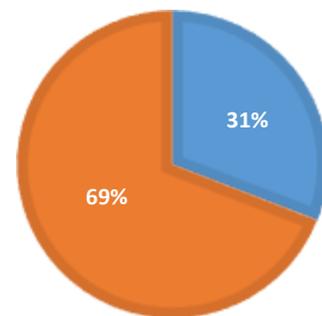


Figure 26: Wall openings current situation by percentage (Author, 2016).

Table 24: Natural elements current situation (SPSS, 2016).

Nature Elements Cross Tabulation		
Nature Elements		Total
With Natural Element	No Natural Elements	
17	93	110

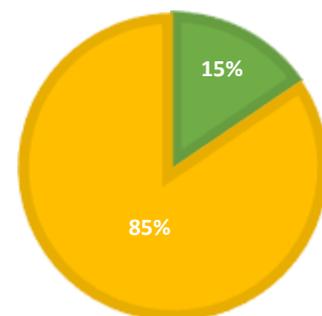


Figure 27: Natural elements current situation by percentage (Author, 2016).

There is no doubt that having a connection with outer nature can affect one's mental and psychological state; a view from a window, a balcony, water element within the work place, plants and trees all can create a

sense of nature within internal environment. Having a connection with external nature has a supportive and calmness effects on human body that can decrease stress symptoms during working hours. Table number 25 shows that 25% of questionnaire participants who lack to wall openings at their work places are feeling stressed and unwell within their offices, while almost 3% only who do have wall openings are feeling stressed. Likewise, having a natural element also affects the participants stress levels, table number 26 shows that 27% are stressed with no natural elements existing at their work places.

Table 25: Current stress levels and wall openings (SPSS, 2016).

Stress Level * Walls Openings Cross Tabulation

		Walls Openings	
		With Wall Openings	No Wall Openings
Stress Level	Comfortable surrounding	8	0
	Stressful surrounding few days a year	16	10
	Stressful surrounding most of the year	7	39
	Stressful and unhealthy surrounding	3	27
Total		34	76

Stress Level * Walls Openings

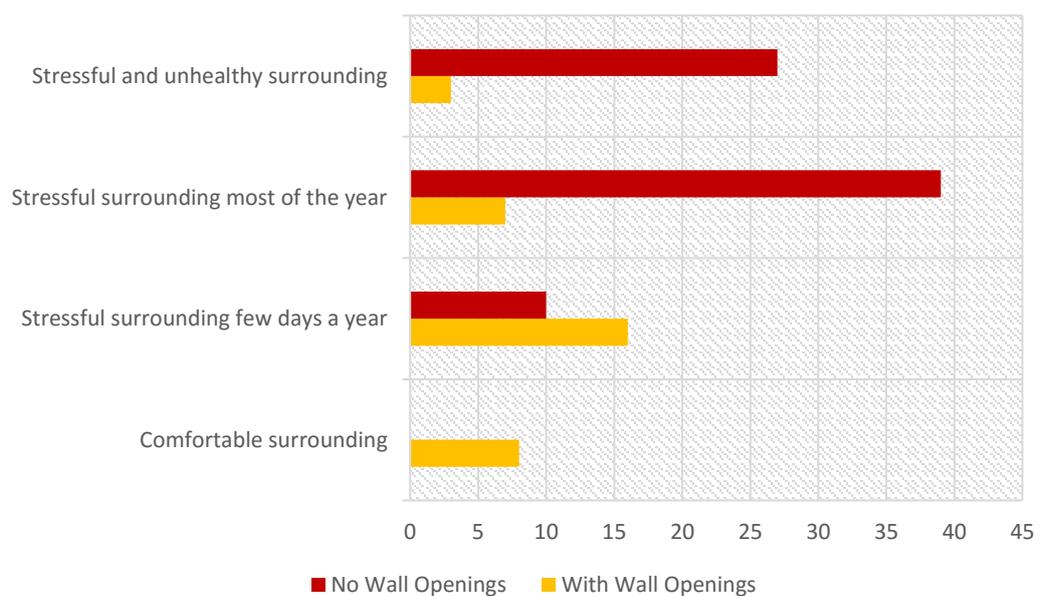


Figure 28: Current stress levels and wall openings (Author, 2016).

Table 26: Current stress levels and natural elements (SPSS, 2016).

Stress Level * Nature Elements Cross Tabulation

		Nature Elements	
		With Natural Element	No Natural Elements
Stress Level	Comfortable surrounding	8	0
	Stressful surrounding few days a year	6	20
	Stressful surrounding most of the year	3	43
	Stressful and unhealthy surrounding	0	30

Stress Level * Nature Elements

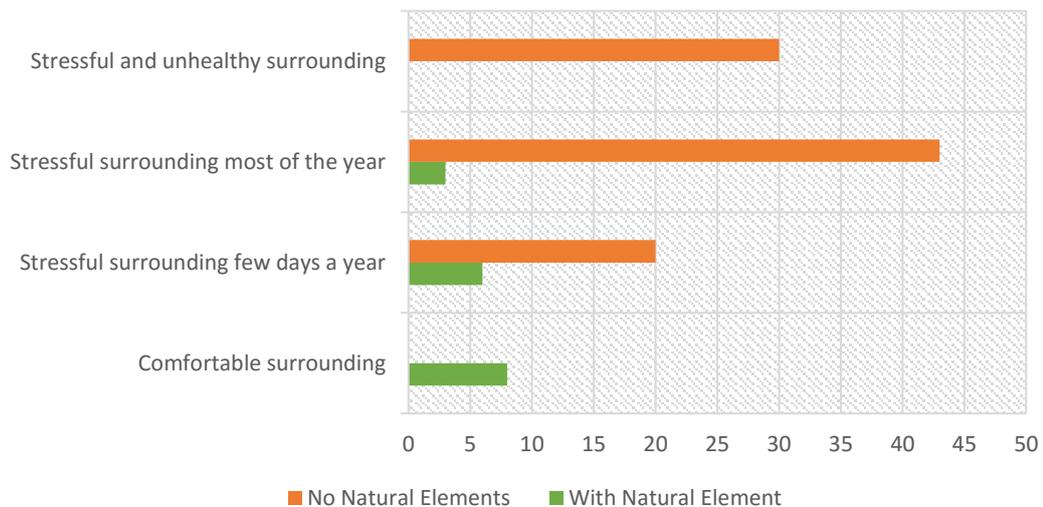


Figure 29 : Current stress levels and natural elements (Author, 2016).

As for the preferred situation for the questionnaire participants 96% preferred having both wall openings and natural elements, not only windows as it is currently, they all prefer having a balcony, a garden and a water element, which can be an effective addition to any work place where employees can take a break from work stress during the day within a psychological, mental and social space.

2.6 Lighting and technology availability

Same as wall openings and natural elements, natural lighting within a work place can offer a sense of connection with external nature, which has great effects on human health; however, in a work place natural lighting alone can't be sufficient enough for most of the employees' tasks, therefore designing a supportive artificial system is a must to help the employees perform their tasks easily.

Table number 27 and figure number 31 show employees' stress levels relation with lighting at their offices; 27% feels stressed and unhealthy under artificially lighted offices and 34% are stressed most of the year. On the other hand, most of the questionnaire participants preferred having both natural and artificial lighting as shown in table number 28, hence natural lighting only is not efficient enough due to limited day light and controlling difficulties in addition to the disadvantages of relying on artificial lighting only such as sight problems and headaches.

Table 27: Current stress levels and lighting (SPSS, 2016).

Stress Level * Lighting Cross Tabulation				
		Lighting		
		Natural	Artificial	Natural and Artificial
Stress Level	Comfortable surrounding	0	0	8
	Stressful surrounding few days a year	0	10	16
	Stressful surrounding most of the year	3	39	4
	Stressful and unhealthy surrounding	0	27	3
Total		3	76	31

Stress Level * Lighting

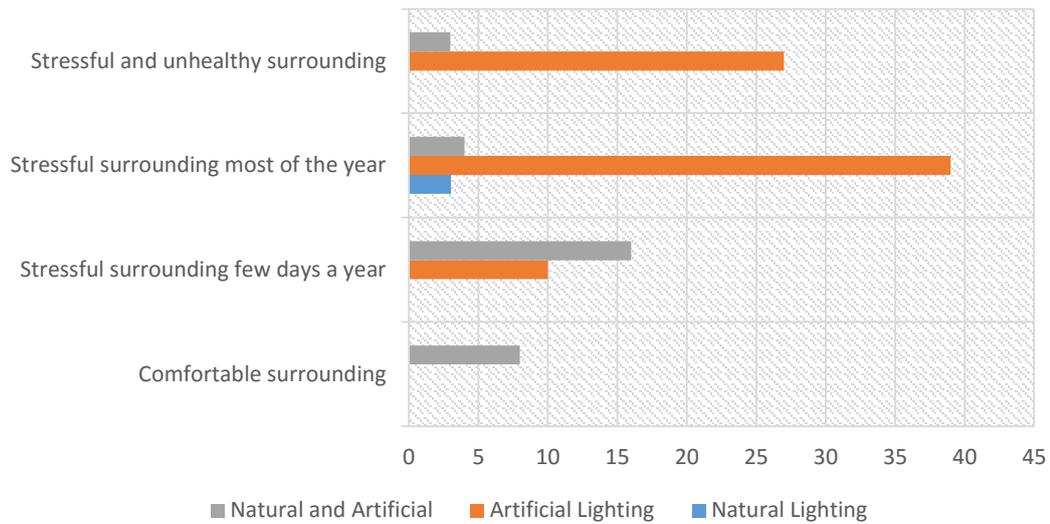


Figure 30: Current stress levels and lighting (Author, 2016).

Table 28: Preferred lighting systems (SPSS, 2016).

Lighting Cross Tabulation			
Count			
	Lighting		Total
	Natural-Lighting	Natural-And-Artificial	
Total	12	98	110

Furthermore, the questionnaire discussed technology availability within employees’ offices and whether they prefer having it or not; unanimously, the questionnaire participants preferred having technology within their offices, not only that, but also they wish to have some other controlling systems such as smart automation systems that allow them controlling lighting, shading, media and air-conditioning. The participants’ desire of having a controlling system expresses one of the basic individual needs of human person, which is the need for feeling dominant and controlling over his/her surrounding as an attempt to feel more safe and secured within the internal environment.

2.7 Social interaction areas and utilities availability

Undoubtedly, having a space within the workplace designed for charging employees' capabilities can leave great effect on their performance and productivity. New York Times in 2013 published an article by Tony Schwartz, who emphasised on the importance of taking renewal breaks during working hours and the importance of working in 90-minute intervals for maximizing productivity. Which can be achieved by having a restorative space within the workplace where the employees can renew their energies and managing it more skilfully and sustainably. The questionnaire discussed having such restorative areas within the participants' work places; tables 29 and 30 display the participants' current utilities and social interaction areas availability; 21% of the questionnaire participants do not have suitable utilities within their workplaces while 78% of them lack for social interaction areas.

Table 29: Utilities availability (SPSS, 2016).

Utilities Cross Tabulation			
Count			
	Utilities		Total
	With Utilities	Without Utilities	
Number of participants	87	23	110

Table 30: Social interaction areas availability (SPSS, 2016).

Social Interaction Area Cross Tabulation			
	Social Interaction Area		Total
	With Social Area	Without Social Area	
Number of participants	24	86	110

Comparing participants stress levels with current interaction areas showed that almost 59% of employees who do not have social interaction areas within their workplaces are stressed and feeling unwell around the year. Moreover, all the participants agreed on the need of having a social interaction area within their workplaces; a cafeteria, garden, lounge,

break time area and whatever space that may allow the employees a break during their working day away from work and its stress. As for utilities availability within the work place; female employees wished to have children day care at their work places, which may solve a sensitive dilemma for working mothers to help them concentrate more at their work performance and productivity. The participants also suggested having separate smoking areas for the benefits of both groups; smokers and non-smokers employees.

Table 31: Stress levels and social interaction areas availability (SPSS, 2016).

Stress Level * Social Interaction Area Cross Tabulation			
		Social Interaction Area	
		With Social Area	Without Social Area
Stress Level	Comfortable surrounding	8	0
	Stressful surrounding few days a year	13	13
	Stressful surrounding most of the year	5	41
	Stressful and unhealthy surrounding	2	28

Stress Level * Social Interaction Area

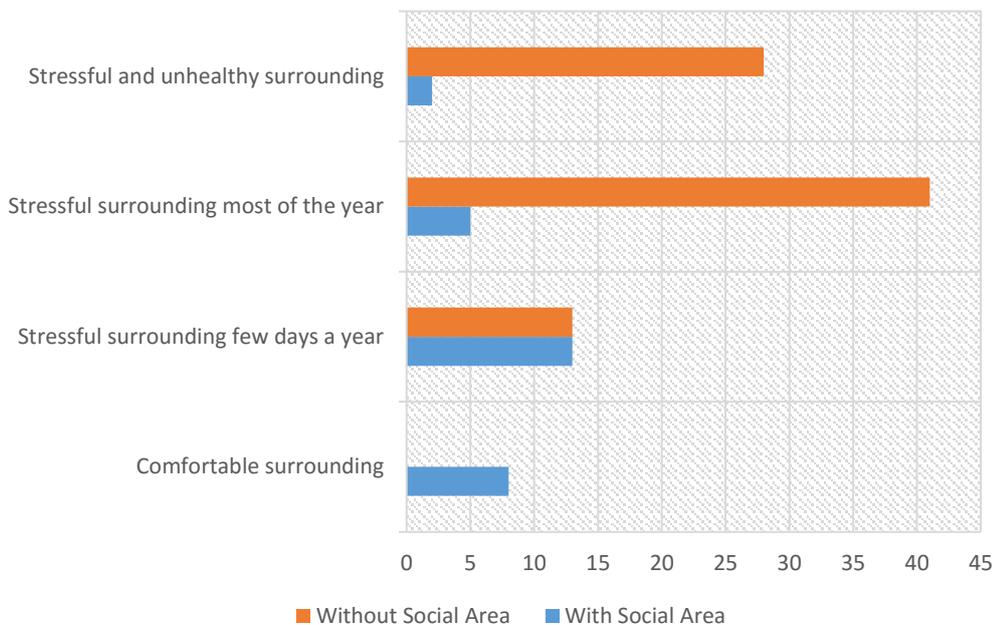


Figure 31: Stress levels and social interaction areas (SPSS, 2016).

2.8 Crowding possibility

Crowding occurs when people density in one space exceeds the comfort level of the space occupants; such situations can affect the user comfort level in the internal environment with the possibility of creating stressful and unhealthy conditions. The necessity of dealing with many people at the same time can cause irritations and annoyance that will eventually affect employees' concentration, performance, stress levels and thus productivity. The questionnaire participants answered a question regarding crowding possibility at their work places, which was compared with the stress levels as shown in table number 32; almost 43% of the participants who may witness crowdedness at their work are stressed around the year. However, when the participants were asked if they prefer to have a crowded work place; 19% of them actually preferred to witness a busy workplace due to their need of feeling involved with other space users, they like having an active work area on the contrary the majority 81% preferred quit work place.

Table 32: Stress levels and crowding possibility (SPSS, 2016).

Stress Level * Crowding Cross Tabulation				
		Crowding		Total
		With Crowding Possibility	Without Crowding Possibility	
Stress Level	Comfortable surrounding	2	6	8
	Stressful surrounding few days a year	16	10	26
	Stressful surrounding most of the year	35	11	46
	Stressful and unhealthy surrounding	12	18	30

Table 33: Preferred crowdedness situations (SPSS, 2016).

Crowding Cross Tabulation			
	Crowding		Total
	With Crowding Possibility	Without Crowding Possibility	
Count	21	89	110

3. Summery

In conclusion and according to the questionnaire results as shown in table number 34, only 7.3% of participants feel comfortable within their workplaces while 27.3% are feeling stressed and unhealthy due to the internal conditions of their work places.

Table 34: Participants stress levels at their work places (SPSS, 2016).

Stress Level	Frequency	Percent %
Comfortable surrounding	8	7.3
Stressful surrounding few days a year	26	23.6
Stressful surrounding most of the year	46	41.8
Stressful and unhealthy surrounding	30	27.3
Total	110	100.0

Any internal space within work environment can affect employees stress levels, however, it cannot be considered the only factor; workload, social relationships, long working hours, job nature and many other reasons also have great influence on employees stress levels. Therefore, a well-designed internal environment that take stress causes in consideration may not eliminate stress completely but it will help the space users to overcome it causes and to conduct their tasks successfully. Providing such a supportive design will not only reduce stress levels, it will also protect employees' mental and physical health, help them restore their energies, renew their capabilities and improve their performance and productivity. The key to design a supportive interior is to design the space components in ways that can offer its users physical, social and psychological support. Air and thermal quality, lighting, acoustics, privacy, furniture, materials, nature connection, space and form are important parameters that can create a supportive work place if well designed.

Chapter Five

Discussion: Nature Implementations Based on Restorative Theories' Principles

1. Introduction

As the questionnaire's results discussed earlier showed that the internal environment designs affect the employees' stress levels within their work places significantly, it also assured that stress levels could mark the employees' psychological, mental, physical and social health. Which bring us to the main purpose of this research; highlighting the needed parameters to create an internal environment that aims to reduce the employees' stress levels within their workplaces. The central direction of the research from its beginning was focused on creating such environment with the involvement of nature through the inner spaces within workplaces. Accordingly, this chapter will discuss the possibility of creating a psychosocial supportive design within workplaces by implementing nature restorative effects on human health.

2. Nature effects on human health

The early years of the 20th century witnessed some new design movements that aimed to improve the occupants' health conditions within internal environments. Architects and designers started to notice the negative effects of poor designs on human health and they headed to create restorative designs as solutions, they suggested at that time that nature has a restorative effect on human health especially on patients and their recovery process as both Stephen Kaplan and Janet Talbot proved in 1983. Later on, researches supported the earlier results and at the same time proved that nature has restorative effects on fighting stress as well (Kaplan 1959, p. 169). Similarly, many researches suggested that there are two main directions to explain the reasons of nature restorative effects on human health. The first one proposed that the person's presence in nature demand him/her to assess the possible dangers out there within seconds, and in the absence of

dangerous situations, nature itself sends signals to human brain, which allow him/her to relax and recover from the early caused stress. The second direction suggested by Kaplan & Kaplan in 1989, depends on the differences between the built environment and the natural one and the human brain ability to assess the information received from both environments. In cities, there are many information to receive and assess, therefore, human brain receives such information as direct attention in the high cognitive centre in the brain. While in natural environments, information received to be assessed is much less in comparison with the ones received from built environment, thus, the soft old parts of human brain will be stimulated to give the higher cognitive a chance to rest during the assessment process and thus for the human body to feel relaxed and satisfied. In both suggestions, space users achieve their inner satisfaction similarly in a work place, a connection with nature is one way to reach inner satisfaction in addition to other ways such as; employees individual tasks, their relationships with their colleagues and their ability of feeling controlling and safe within the internal environment (Stigsdotter 2001, p.147).

Clare Marcus, a professor who discussed the effect of gardens on human health stated “Nature-oriented spaces which have the potential to promote restoration from stress via passive contact (such as looking out through a window), or via low-level physical activity such as walking, sitting, and talking, are taking on more significance”. She also displayed previous researches and experiments that support natural restorative concept, such researches depended on recording people physical changes like blood pressure when they are stressed due to inconvenient created situation and when they attend to recover by viewing a natural element on a way or another. All cases had remarkable changes in their physiological responses after connecting with nature (Marcus n.d, p.62). The strong restorative effect of nature is emerged from the person’s need to take a pause during their days as an attempt to recover from the daily stress. Since nature has less information to receive and asses, therefore, it is the suitable place for a stressed person

for his/her day-pauses, recover and recharging energy especially in work places.

3. Restorative theories and suggested nature implementations

Many theories have been created to discuss restorativeness and its effects on space users; one of the most discussed theory is Attentional Restorative Theory (ART), which was developed by Rachel and Stephen Kaplan in the 1980s in their book (*The experience of nature: A psychological perspective*). According to the famous ART, four aspects can help creating a restorative experience; Being away, Extent, Compatibility and Fascination (Fischl 2006, p. 58). All four aspects can provide an opportunity for the space user to recover from their daily stressors especially if these four aspects are provided within natural frame. In a natural environment the option of getting away is available to recover from work stressors as the Kaplan's suggested in this matter; getting away can be achieved by escaping from the surrounding distractions, make a distance between the employee and his/her work load and postpone his/her usual work tasks and activities. Undoubtedly, a natural environment or element within the work place can provide such escape for stressed employees. The second aspect; Extent, also can be achieved within a natural environment. It mainly expresses the environment elements relations and their connectedness and scope. An employee has better opportunity to experience a conceptual extended perception of the space elements within a natural environment than a built one, where the scale of his/her conceptual extent depends on the surrounding natural environment mass, being in a garden have different extent effects than having a plant in the office, however, both have restorative effects. Another restorative aspect according to ART that also could be achieved within a natural frame is Compatibility, which refers to the harmony between the space user's aims, demands and what information he/she can receive from the surrounding environment to support his/her goals. Within a natural environment, such harmony is possible since no data is needed to be assessed and analysed as in built environment, which allow the space user to concentrate on his/her both short and long-term goals and demands. Finally, the last aspect of a

restorative experience according to the Kaplan's is Fascination; a fascination experience can be achieved if the space has enough complexity and mystery in which the user can forget his/her life stressors. If the space user spends his/her time noticing the space variety of elements or tried to find out its hidden information then he/she will be drawn by the space mystery (Fischl 2006). Such a space within workplaces can offer the employees pleasant experiences driven by aesthetics motivations, which can be found within Mother Nature, a permanent source for human kind to be fascinated and motivated through their daily lives. Providing the four aspects of a restorative experience within workplaces can have great effects on the employees' social and psychological health, and nature is clearly the ideal implementation for such experience. A garden within the workplace, a view of a window, the availability of natural lighting or internal landscaping, all have the ability of escaping, fascinating and creating different feeling of compatibility and extent for the space user. Consequently, nature have the power of calming, recovering, promoting and improving human physical and psychosocial health.

Another theory that discussed the internal space recovery effects on its occupants is Salutogenesis by Aaron Antonovsky in 1979, who dealt with space's factors that support the user's health away from illness and stress. "According to Antonovsky, a salutogenic approach to health focuses on factors that actively promote improved health and wellbeing, instead of focusing solely on factors that cause disease and injury, which is known as a pathogenic approach. An ideal state of health, he says, is attained by addressing the root causes of unhealthiness, not by simply treating an illness " (Towery 2013). Antonovsky researches concentrated on the health care sector buildings to figure a way a better recovery process, however, many studies are been conducted to implement Salutogenesis' principles within all sectors not only health care facilities and hospitals. Dr. Robert Ulrich is one of many researchers who developed a new theory based on Salutogenesis' principles; Theory of Supportive Design (Towery 2013). Ulrich noticed that a patient with tree view from a near window most likely would

recover sooner than another patient who have no nature contact. Therefore, he focused on nature connection within the inner space, however, in his opinion; such a connection is not limited to nature exposure only or outer activities, it could be created by buildings' structures and hidden metaphors that can create a sense of individual basic needs such as feeling controlling over the surrounding environment, being sheltered and feeling safe. Chris Towery in his article (*Salutogenic Design: Building Better Health*) that was published in 2013 suggested an example of natural metaphor that can be implemented within built environments to provide better psychological supportiveness for the space user; "Take, for instance, the potential of a structural metaphor of a tree as shelter. Trees are ubiquitous enough that almost everyone has a set of associations with them, and, for the most part, those associations are shared. Trees are static, stable objects. People gather under them or use them to escape the sun. They are familiar. They offer a reassurance of structural integrity. In Seville, Spain, the Metropol Parasol, designed by German architect Jürgen Mayer H., offers shade for the Plaza de la Encarnación and a defined yet permeable space under its canopy of waffled cross-laminated timber. Like the canopy of a tree, it allows complete freedom of entry and exit while providing a sense of shelter and being firmly rooted." (Towery 2013). Such implementations can help providing sense of nature within built environment especially if natural spaces are not available as it is the case for most of the city centres where office buildings' capacity is the highest.

Another nature implementation that can help creating psychosocial supportive designs within workplaces and at the same time is evolving from one of the most important supportive theory is Alan Dilani's, where he discussed the importance of design for human senses. As Dilani is the creator of the term psychosocial supportive design, he discussed in his theory the possibility of promoting human health by provoking the person's senses. "Aesthetic enjoyment through wellbeing- of the eyes, the ears, touch taste or smell- is a fundamental human need. Like other abilities, the senses need stimulation and

practice to thrive” he stated in 2001 in his article (Psychosocially Supportive Design; As a Theory and Model to Promote Health). Providing an environment where senses provocation is possible to attract the space user’s attention away from his/her daily stressors especially within workplaces would leave great positive influence on the employee’s mental, social and psychological health. It’s no secret that nature provoke human senses the most, the availability of natural scenes within workplaces would for sure catch the employee’s attention away and occupy his/her sight, hear, tactile and smell. As mentioned before, nature implementations within internal environment does not have to be a direct connection or exposure to nature only. A structure educed from one of the nature roles, a sound of running water somewhere in the office, a statue or a monument with natural educed lines that can catch the user’s eyes or floor and ceiling tiles that simulate natural movements, textures, shapes and forms, all can engage the employees’ senses and thus engage them mentally, psychologically and socially to encourage their minds to start a mental process that can attract their attentions away from stress, irritation and anxiety factors.

4. Summery

Restorative theories from their beginning had set some basic parameters to help creating supportive designs, they all agreed on the need of promoting human health within built environments instead of curing the illness only. They also emphasised on the need of providing internal space where its users can avoid stress and its negative influence on their lives and health. Therefore, chapter 5 discussed the possibility of implementing these theories concepts within natural frame. It suggested that restorative theories principles can all be achieved through nature and its elements, roles, movements, sounds, lines, textures and any other factor that can make the space user feels connected to nature and thus separated from his/her daily stressors. Furthermore, chapter 5 also had drawn the path to suggest some characteristics of a psychosocial supportive design within workplaces educed from the research literature review, restorative theories and nature implementation concept.

Chapter Six

Psychosocial Supportive Design Suggested Parameters

1. Introduction

The main purpose of the research is to set some parameters that can help designing a supportive environment within workplaces to reduce work stress effects and its health problems in addition to promote the employees' mental, physical, social and psychological health. Chapter 6 will list some suggested characteristics for psychosocial supportive design within work places.

2. Supportive design characteristics

2.1 Sense of control and security

Providing a restorative space within work environment that can support the users' sense of control, which is one of the fundamental human need can help reducing stress levels during working hours. Offering the choice of being within private place, semi social place or a social one will enhance the controlling feeling of an employee especially if he/she is undergoing number of orders and commands, which may leave him/her with a feeling of not being able to control his/her, own actions. Switching the light on or off, opening a window, changing air conditioning temperatures, exiting or entering a certain place all can consider small actions but they all can create a controlling feeling for the employees. Another human need that a person should be able to find within built environment, is the need of feeling safe and secure. The suggested restorative space within work places should be away from possible threatens or loud noises. A restorative space near or within a parking lots for instance will take away restorativeness meaning and purpose, similarly restorative space near to construction site, movement areas or windy spots.

2.2 Social support

Another potential characteristic of a supportive space within workplaces is offering social possibility for the employees who prefer being a part of social groups, without eliminating privacy possibility for those who prefer solitary. Researchers had proofed that making a conversation with others have a calming effect on the person stress levels, finding a space within ones' workplace where conducting general discussions away from work tasks and responsibilities will ease the employees' minds and recover their tranquillity and peace before getting back to work load and stress. Furthermore, providing a space with social support within the work place emphasis on the human need of controlling his/her surrounding by giving the choice of being social and involved at times or being isolated at others.

2.3 Physical movement possibility

Spending almost eight hours a day sitting on a desk can for sure cause some series physical problems such as back and neck ache, which considered one of the main reasons of increased stress at work places. Therefore, providing a space where employees have the opportunities to stretch their spines among long seated periods can improve their physical conditions, prevent health problems, and thus reduce stress caused by stiffed bones. For instance, many office buildings nowadays keen to have a gymnasium ball within their facilities as an attempt of encouraging their employees to work out during their lunch break. However, such solution may not be possible for all building and designs, therefore, more simple solutions can be implemented with the help of nature by for an example providing a garden, a hallway, a courtyard, a front yard of the building or even providing enough spaces between offices for the simplest stretching exercises.

2.4 Visibility and accessibility

Any restorative design within workplaces should have the ability to achieve its purpose at its minimum use, if an employee could not seize few minutes during a busy day to recover and reset his/her energy, then the ideal design of restorative workplace should offer that employee a continuous visibility and accessibility to nature or to restorative elements. If a garden or a court yard is out of the designer choices then internal landscaping, continuous existence of plants, water elements, natural sounds, repeated nature scenes or natural light all could be considered restorative elements if their visibility and accessibility are designed in a way that affects the employee while sitting in his/her desk.

2.5 Physiological Comfort

There is no doubt that achieving psychosocial supportiveness is impossible with the absence of physiological comfort. One of the must-be characteristics within a supportive design within workplaces is taking employees' physiological comfort in consideration. Different implementations can help increasing the employees' physiological comfort within their workplaces such as; separate social interaction areas especially in conservative regions and cultures, separate smoking areas, multiple seating choices in social interaction areas, shading structures in external seating areas or even providing napping areas for the employees to rest 20-30 minutes and recharge their energies during their working hours as Google and other leading companies are providing at their head offices.

2.6 Quietness

The restorative supportive spaces within workplaces is designed to offer the employees an escape from workloads and offices noise, therefore, creating a quite design is essentially for achieving psychosocially supportiveness main purpose. Within workplaces, different facilities locations should be taken in consideration while designing such as; parking lots, offloading sites, services entries, movements and gathering areas and any other loud facilities that may cover the quietness of the restorative space and the preferable sounds of nature.

2.7 Positive design features

Designing a supportive workplace that allow the employees to escape their stressors during working hours may include providing a separate restorative space for such purpose, however, restorativeness within work places cannot be limited to that space only since many building don't have the luxury of unoccupied areas. Therefore, psychosocial supportiveness should be integrated within building internal spaces design to allow the employees recovering process at their working areas or offices. Such integration can be easily achieved by adding some design features that send positive emotions around offices and working areas like happiness, joy, peacefulness, satisfaction, calmness and anticipation. Natural scenes, internal landscaping, natural light access, natural plants, paintings, murals, sculptures, music, nature sounds, colours, natural metaphors and any feature educed from nature that can cause positive motions and feelings within workplaces and at the same time reduce negative feelings such as anger, irritation, anxiety, aggression and fatigue. Furthermore, providing positive design features within workplaces have the ability of directing the employees' attentions towards positive situations and solutions that will help avoid mistakes and will improve their performance and productivity.

3. Summery

Chapter 6 is summarizing the research objective of setting some parameters of a psychosocially supportive design within workplaces; it is suggesting some characteristics that can help improving the internal work place environments by decreasing stress effects and promoting human mental, social, physical and psychological health. Sense of controlling, social support, physical movements' possibility, visibility, accessibility, physiological comfort, quietness, positive design and natural integration, all these characteristics can work side by side to create the ideal supportive environment for the employees at their work places.

Conclusion

Providing a restorative space within workplaces can have great impact on employees' health, performance and productivity. Designers, engineers and sociologists knew restorativeness impacts from the early years of the twentieth century, therefore, many theories and studies were imposed and suggested as attempts to set clear path for restorativeness. Likewise, this research aimed from its beginning to set some parameters and characteristics of the psychosocially supportive designs especially within workplaces where a person undergoes stressful situations continuously. By applying a methodology of collecting data where a questionnaire was distributed among number of employees from different work environments, the results helped drawing clear path to answer the research main question; how can the built environment (work places in particularly) provide psychosocial supportiveness for their occupants and what nature can offer in this term. Analysing the questionnaire results and the participants' opinions in addition to the knowledge collected from the research literature review, the author was able to present some characteristics of supportive space that can improve its occupants' health and reduce their stress levels and effects. The author also based on participants' opinions, was able to state that natural integrations with its different implementations (direct or metaphor) can offer great role in restorativeness and supportiveness. Positive design features, Quietness, Physiological Comfort, Sense of control and security, Social support, Visibility and accessibility and Physical movement possibility all are parameters that help reducing stress levels and negative emotions and at the same time have the ability of not only preserving human health but also promoting it, encouraging positive emotions, increasing self-satisfaction, improving employees performance and increasing productivity.

Furthermore, Psychosocially Supportive Design can offer to humanity many capabilities, which are not only concerned about human health; it can also be related to economy and energy conservation. For instance, if the employees are healthy around the year, then their performance ratio will be stable and their productivity will increase by which the company outcomes and benefits will grow. While if the working conditions are unhealthy or stressful, then employees' sick leaves and absence will become more often, and as a result the company medical expenses will increase which means less outcomes. Furthermore, the unhealthy working conditions will affect the employees' performance, so mistakes will occur, accuracy will decrease as well as productivity, and thus business profits will be affected.

Finally, psychosocially supportive design concepts and principles are not yet applied effectively within built environments it still has some challenges to face and overcome. Such as limited available areas within existing buildings, the traditional mentalities that refuses any new designing concept, lack of share capitals that believes in the need of changing and above all, the owners of capitals' greed which consist of exploiting their buildings to the max with no respect what so ever to the individual's needs. However, one cannot deny the growing awareness of psychosocially supportive design concepts and their positive effects on human health as discussed in this research. Also the psychosocially supportive design role in energy conservation and economic benefits, which can be profitable subjects for further studies in the future to highlight all its aspects and benefits whether health, economy or energy wise.

References

- Aardex Cooperation. (2004). *Users Effective Buildings* [online]. [Accessed 06 November 2016]. Available at: <https://www.amazon.com/User-Effective-Buildings-Aardex-Corporation/dp/0975552406>
- Alaska Indigenous. (2012). *Human Behaviour and the Interior Environment* [online]. [Accessed 30 May 2016]. Available at: <https://alaskaindigenous.files.wordpress.com/2012/07/human-behavior-and-the-interior-environment2.pdf>
- Bhanap, I. (2013). Coherence: An analysis of roadway noise at residential estates in close proximity to expressways in Singapore. *Noise and Health* [online]. [Accessed 20 February 2016]. Available at: <http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2013;volume=15;issue=64;spage=183;epage=189;aualast=Bhanap>
- BMJ .(2011). *How should we define health?* [online]. [Accessed 25 December 2016]. Available at: <http://savenhshomeopathy.org/wp-content/uploads/2012/09/Huber-Definition-Health-BMJ-21.pdf>
- Condra, M. (2013). *What is Mental Health? with Dr. Mike Condra* [online]. Viewed 7 January 2016. Available at: <https://www.youtube.com/watch?v=aNQBdIMM3mQ>
- Cooper, C. (2004). HUMAN SPACES REPORT: Biophilic Design in the Workplace. *Human Spaces: Spaces Designed with the Human in Mind* [online]. [Accessed 7 November 2016]. Available at <http://humanspaces.com>

- Craig, D. (2010). The workplace's impact on time use and time loss. *DEGW* [online]. [Accessed 10 December 2016]. Available at http://lubswww.leeds.ac.uk/fileadmin/webfiles/cstsd/Images/PowerPoint_Presentations/Time_use_and_time_loss_-_DEGW_7Aug2010_-_FINAL.pdf
- Dilani, A. (n.d). Psychosocially Supportive DesignAs a Theory and Model to Promote Health . [online]. [Accessed 27 May 2016]. Available at: [file:///C:/Users/jihan/Downloads/Alan-Dilani-WCDH-2005%20\(2\).pdf](file:///C:/Users/jihan/Downloads/Alan-Dilani-WCDH-2005%20(2).pdf)
- Environmental Health Perspective (EHP). (2014). *Environmental Noise Pollution in the United States: Developing an Effective Public Health Response* [online]. [Accessed 15 January 2016]. Available at: <http://ehp.niehs.nih.gov/1307272/>
- Evans, G & Mccoy, J. (1998). WHEN BUILDINGS DON'T WORK: THE ROLE OF ARCHITECTURE IN HUMAN HEALTH. *Journal of ENVIRONMENTAL PSYCHOLOGY* [online]. [Accessed 20 December 2016]. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.4.5633&rep=rep1&type=pdf>
- Fergus, A. (2015). Blue Light and Melatonin. *How Technology & Blue Light Is Ruining Sleep & Making You Sick Fat & Tired (And How To Fix It)* [online]. [Accessed 03 January 2016]. Available at <https://www.alexfergus.com/blog/how-technology-blue-light-is-ruining-sleep-making-you-sick-fat-tired-and-how-to-fix-it>
- Fichl, G. (2006). Psychosocially supportive design in the indoor environment. [online]. [Accessed 20 May 2016]. Available at: <file:///C:/Users/jihan/Desktop/Dissertation/References/Geza%20Fischl%202006.pdf>

- Health and Safety Executive (HSE). (2000). *How to deal with sick building syndrome (SBS)* [online]. [Accessed 22 November 2016]. Available at: <http://www.hse.gov.uk/pUbns/priced/hsg132.pdf>
- International Commission on Illumination (CIE). (1987). *Right Lighting and Energy Efficiency* [online]. [Accessed 11 May 2016]. Available at: <http://www.cie.co.at/index.php>
- Kaplan, S. (1995). *THE RESTORATIVE BENEFITS OF NATURE: TOWARD AN INTEGRATIVE FRAMEWORK* . [online]. [Accessed 27 May 2016]. Available at: [file:///C:/Users/jihan/Downloads/Alan-Dilani-WCDH-2005%20\(2\).pdf](file:///C:/Users/jihan/Downloads/Alan-Dilani-WCDH-2005%20(2).pdf)
- Marcus, C. (n.d). Gardens and health. [online]. [Accessed 2 May 2016]. Available at: <file:///C:/Users/jihan/Desktop/Dissertation/References/garden%20and%20health.pdf>
- May, K. (2013). 9 ways that sound affects our health, wellbeing and productivity. *TED Blog* [online]. [Accessed 03 January 2016]. Available at <http://blog.ted.com/9-ways-that-sound-affects-our-health-wellbeing-and-productivity/>
- McCraty, R. (2010). Coherence: Bridging Personal, Social, and Global Health. *ALTERNATIVE THERAPIES* [online]. [Accessed 20 December 2016]. Available at: <https://www.heartmath.org/assets/uploads/2015/01/coherence-bridging-personal-social-global-health.pdf>
- Nordqvist, C. (2015). What Is Health? What Does Good Health Mean?. *MNT* [online]. [Accessed 25 December 2016]. Available at <http://www.medicalnewstoday.com/articles/150999.php>

- Planning Office Spaces. (2010). *A PRACTICAL GUIDE FOR MANAGERS AND DESIGNERS* [online]. [Accessed 30 November 2016]. Available at: <http://www.planning-office-spaces.com/index.php>
- Public Health England (PHE). (2013). *Physical Environment* [online]. [Accessed 17 January 2016]. Available at: <http://www.wmpho.org.uk/topics/page.aspx?id=1538>
- Public Health Ontario (PHO). (2012). *Social Determinants of Health* [online]. Viewed 10 January 2016. Available at: <https://www.youtube.com/watch?v=neuQN6F17Io>
- Richards, J. (2012). Social Determinants of Health. *MAINTAINING A HEALTHY WEIGHT* [online]. [Accessed 27 December 2016]. Available at <https://jrichardsblog.wordpress.com/2012/09/15/social-determinants-of-health-4/>
- Sarbu, I & Sebarchievici, C. (2011). Olfactory Comfort Assurance in Buildings. *Environmental Sciences* [online]. [Accessed 02 December 2016]. Available at <http://www.intechopen.com/books/chemistry-emission-control-radioactive-pollution-and-indoor-air-quality/olfactory-comfort-assurance-in-buildings>
- SCHWARTZ, T. (2013). Relax! You'll Be More Productive. *Sunday Review* [online]. [Accessed 23 April 2016]. Available at: http://www.nytimes.com/2013/02/10/opinion/sunday/relax-youll-be-more-productive.html?_r=1
- Smith, S. (2014). How Maslow's Hierarchy of Needs influences Employee Engagement. *HRZone* [online]. [Accessed 23 January 2016]. Available at: <http://www.hrzone.com/community/blogs/steve-smith-0/how-maslows-hierarchy-of-needs-influences-employee-engagement>

- Stigsdotter, U. (2001). A Garden at your Work Place May Reduce Stress. [online]. [Accessed 2 May 2016]. Available at: <file:///C:/Users/jihan/Desktop/Dissertation/References/a%20garden%20at%20your%20work%20place%20may%20reduce%20stress.pdf>
- Tiwari1, R, Pandey, M & Sharma, A (2010). An Approach to Human Adaptability towards its Built Environment: A Review. *Energy and Power Engineering* [online]. [Accessed 20 December 2016]. Available at: http://file.scirp.org/pdf/EPE20100200002_36733291.pdf
- Towerly, C. (2012). Relax! You'll Be More Productive. *Owners Perspective* [online]. [Accessed 23 April 2016]. Available at: <http://ownersperspective.org/features/item/408-salutogenic-design-building-better-health>
- WebMD. (2014). *Asbestos Exposure* [online]. [Accessed 06 April 2016]. Available at: <http://www.webmd.com/lung/asbestos-exposure>
- Wikipedia. (2016). *Aaron Antonovsky* [online]. [Accessed 01 June 2016]. Available at: https://en.wikipedia.org/wiki/Aaron_Antonovsky
- Weil, A. (2013). *Definition of Health* [online]. Viewed 10 March 2016. Available at: <https://www.youtube.com/watch?v=n4AU-XNq04k>
- World Health Organization (WHO). (2001). *Mental Health: New Understanding, New Health* [online]. [Accessed 15 January 2016]. Available at: http://www.who.int/whr/2001/en/whr01_en.pdf?ua=1
- World Health Organization (WHO). (2014). *Mental health: a state of wellbeing* [online]. [Accessed 15 January 2016]. Available at: http://www.who.int/features/factfiles/mental_health/en/
- Yolo-Solano. (n.d). *Air Quality Management District*. [online]. [Accessed 28 December 2016]. Available at: <http://www.ysaqmd.org/faqs/aqi-faq.php>

Appendix A

Table 14: Differences between pathogenic and salutogenic (Becker, Glascoff and Felts, 2010).

Pathogenesis	Salutogenesis
Start Point: Disease or Problem.	Start Point: Health Potential.
About avoiding problems and its causes.	About approaching potential and its causes.
Works to eliminate risk factors.	Works to create health (salutary) factors.
Reactive - react to signs, symptoms, and indications of disease.	Proactive - create conditions of physical, mental, and social well-being.
Disease or infirmity is an anomaly.	Humans flawed and subject to entropy.
Idealistic perspective - treat disease.	Realistic perspective - go get health.
Focus is to prevent pain or loss.	Focus is to promote gains or growth.
Prepares or help prepare one to live.	Enhance capacities and potential so can live fully.
Wants to help avoid or prevent a person from being pushed backward.	Wants to help or enhance a person's ability to move forward.
Against Disease and infirmity.	For Health.
For those who need healing cures.	For those who want better health.
Primary focus - Prevention of negative health.	Primary focus - Promotion of positive health.
Secondary benefit - Health Promotion.	Secondary benefit - Prevention of disease and infirmity.
Outcome - absence of problem.	Outcome - presence of a gain.
Keep from making situation worse.	Continuous Improvement.
Minimization of problems.	Optimization of potential.

Appendix B

Table 15: Indoor air quality pollutants and their effects on human health (ELF, 2016).

Pollutants Cause	Sources	Pollutants	Health Effects
Anthropogenic Pollutants	Unvented gas/kerosene heaters	CO/CO ₂ /NO ₃ /PAHs	<ul style="list-style-type: none"> • Respiratory symptoms • Lung function reduction • Bronchial hyper responsiveness <ul style="list-style-type: none"> • Asthma • COPD • Upper/lower respiratory tract irritation
	Biomass (wood/coal) for heating/cooking	CO/CO ₂ /PM/PAHs	
	Tobacco smoke	CO/CO ₂ /PM/VOCs, PAHs	
	Wood (fireplaces)/gas ranges – pilot lights	VOCs	
	New furniture/solvents/painting/adhesives/insulation/cleaning products/materials for offices	VOCs Formaldehyde	
	Building materials/water	Radon	
Environmental Pollutants	Dust/beds/carpets	Acarides (HDM)	<ul style="list-style-type: none"> • Sensitisation (specific/total IgE) • Respiratory allergic diseases (asthma, rhinitis) • Hypersensitivity pneumonitis • Chronic cough
	Pets/birds/insects/rodents		
	Dampness	Moulds	
	Plants	Pollens	
	Viruses/bacteria	Biological Contaminants	

Appendix C

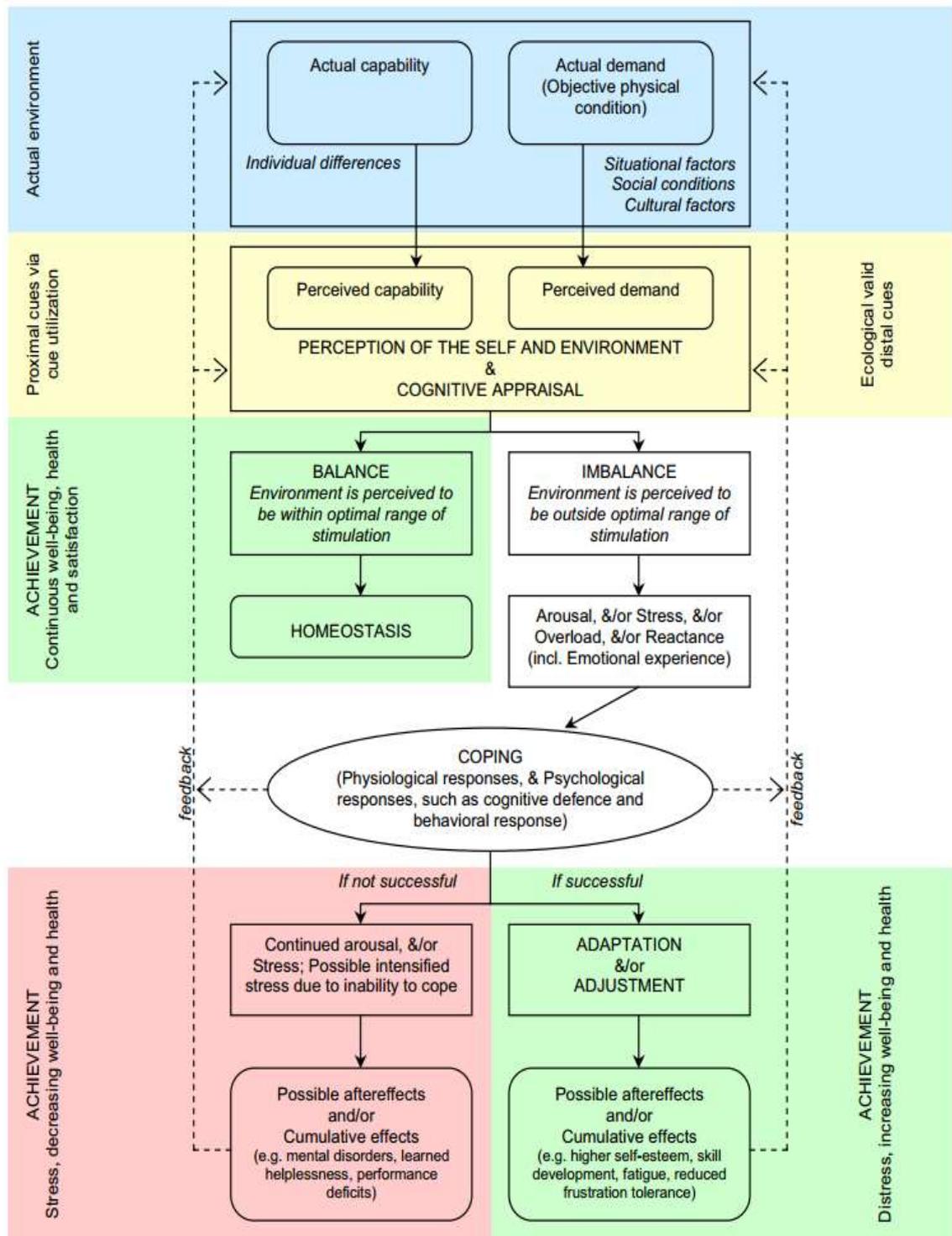


Figure 32: Individual-environment-behaviour model (Fischl, 2006).

Appendix D

Employee Impression Survey

Work Place Environment



Dear Sir/Madam,,,

Thank you for agreeing on helping me by taking part in this important survey to complete my master degree thesis for British University in Dubai.

The purpose of this survey is to collect your thoughts and opinions regarding work place environments and what make them healthy, positive and supportive environments for the employees.

The information provided will be used for research purposes only thus be assured that your identity and answers are kept in the strict confidentiality. Please note that there is no right or wrong answer, so kindly answer the below questiones as honestly as you can.

Age:

.....

Gender:

.....

Work Designation:

.....

Date:

.....

Nationality:

.....

1. Your company sector:

- Governmental
 Semi-Governmental
 Private

2. Your company location:

.....

3. Traffic around your office:

a. Current situation

- Yes, there is traffic around the office. No, it is a quiet area around the office.

b. What you prefer

- Yes, I prefer traffic around the office. No, I do not prefer having traffic around the office.

4. Your company offices distribution:

a. Current situation

- Open space offices (Employees desks are distributed in one space) Separate offices (Each employee has his/her own office room)

b. What you prefer

- Open space offices (Employees desks are distributed in one space) Separate offices (Each employee has his/her own office room)



5. Your desk direction:

a. Current situation

- Facing a wall Facing colleague Facing a window Facing a movements area

b. What you prefer

- Facing a wall Facing colleague Facing a window Facing a movements area

6. Behind your desk:

a. Current situation

- Wall Colleague Window Movements area

b. What you prefer

- Wall Colleague Window Movements area

7. Your office furniture materials

a. Current situation

- Wood
 Metal
 Plastic
 Leather

b. What you prefer

- Wood
 Metal
 Plastic
 Leather

8. Your office walls and partitions finishes

a. Current situation

- Paint
 Glass
 Metal
 Wood

b. What you prefer

- Paint
 Glass
 Metal
 Wood

9. Your office floor finishes

a. Current situation

- Marble
 Hardwood
 Concrete
 Carpet
 Rubber

b. What you prefer

- Marble
 Hardwood
 Concrete
 Carpet
 Rubber

10. Your office wall colour

a. Current situation

- Light color:
 Dark color:

b. What you prefer

- Light color:
 Dark color:

11. Wall openings (windows, glaze, balconies)

a. Current situation

- Yes, there is a
 No, there is no wall opening.

b. What you prefer

- Yes, I would like to have a
 No, I do not prefer wall openings.

12. Nature Elements (View from a window, courtyard, water element, plants, trees)

a. Current situation

- Yes, there is a
- No, there is no natural element.

b. What you prefer

- Yes, I would like to have a
- No, I do not prefer natural elements.

13. Lighting in your office:

a. Current situation

- Natural Lighting Artificial Lighting Both

b. What you prefer

- Natural Lighting Artificial Lighting Both

14. Technology availability at your office (Computers screen, servers, data show projector, light control system)

a. Current situation

- Yes, there is a
- No, I do not use technology features.

b. What you prefer

- Yes, I prefer using technology features.
- No, I do not prefer using technology features.

15. Utilities availability (Kitchen, smoking area, separate toilets, parking, praying room, nursery for working mothers)

a. Current situation

- Yes, there is a
- No, utilities facilities are not available.

b. What you prefer

- Yes, I prefer having utilities facilities.
- No, I do not prefer having utilities facilities.

16. Social interaction areas (cafeteria, garden, break time area)

a. Current situation

- Yes, there is a
- No, there is no social interaction area available.

b. What you prefer

- Yes, I would like having a
- No, I do not prefer having social interaction areas.

17.Crowding possibility (The possibility of having a crowded work place during the day)

a. Current situation

- Yes, There is crowding possibility.
- No, there is no crowding possibility.

b. What you prefer

- Yes, I prefer crowded areas.
- No, I do not prefer crowded areas.

18.Stress Level within your work place (Kindly choose one of the below options)

- Comfortable surrounding
- Stressful surrounding few days a year
- Stressful surrounding most of the year
- Stressful and unhealthy surrounding

Opinions;

What causes daily stress?

.....
.....

What improves an employee’s mental and emotional status during the day?

.....
.....

Additions you would like to add to your work place to improve it as employee:

.....
.....

Thank you very much for taking the time to complete this survey. Your feedback is valued and very much appreciated!

When completing the survey kindly send it to the email below:

jihanazzazi@gmail.com