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Emad Eldin Hamdy Abdelhamid Abdrabboh  
*Canadian international college (CIC)- Egypt*, emadeldin\_hamdy@cic-cairo.com

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## Improving the architectural design of public dining spaces in Cairo, via examining the users' opinion of the physical environment and emotions states

Dr. Emad Eldin Hamdy Abdelhamid Abdrabboh

Canadian international college (CIC)- Egypt, emadeldin\_hamdy@cic-cairo.com

### Abstract:

The development of the architectural design of public buildings is a prerequisite for the development of urbanism in urban societies. Public dining spaces (PDS) have a distinctive place in contemporary shopping and entertainment spaces. Public dining spaces physical environment elements (PDPEE) requires to be studied and tested from the users' point of view, the study was conducted in 6 (PDS) in Cairo, Egypt, a structural questionnaire was distributed to visitors of (PDS), (PDPEE) was summarized in 5 elements. Based on the literature review, the quality of the questionnaire was confirmed by the Alpha Cronbach test. In order to inspect the opinion of (PDS) visitors about the priorities of (PDPEE) and its association with the emotion state (ES), behavior intentions (BI) the study utilized a two-step methodology based on I. Confirmatory factor analysis (CFA). II. Structural equation model (SEM), Results are analyzed based on SPSS, AMOS software, to generate the results, the study relied on the Spearman test and chi-square test, as for the results' validation, confidence intervals, effect size was calculated for the previous tests, the results indicated that lighting and finishing materials in particular and aesthetic elements in general are the most important elements of (PDPEE). Clearly, this study illustrates that there is a close direct correlation between (PDPEE)/(ES) and (BI), the relationship between comfort emotion (CE) generated from (PDPEE) and the visitors' age, the visit day (VD), the visit time (VT) in the morning or evening is proven, while pleasure emotion (PE) has a correlation with (VD) only.

### Keywords:

Public dining spaces,  
Architectural Design,  
Users' Emotions States,  
Public Buildings,  
Users' Opinion

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### 1. Introduction

(PDS) are found in many types of buildings, and they are the most famous architectural elements associated with malls and recreational buildings in particular and public buildings in general<sup>i</sup>, as well as in educational buildings, universities<sup>ii</sup>. Likewise, the (PDS) was one of the main components in the early malls, in (Market Square) project that was established in 1916 in Chicago<sup>iii</sup>. Lately, dining spaces occupy a distinctive position in the urban context and the built environment in general and in public buildings in particular. Undoubtedly, the success of the (PDS) leads by extension to the comfort and pleasures of visitors, Since shopping malls (Malls) no longer just rely on visiting and on conventional shopping, however, a significant transition towards visitors has occurred, which depends on the entertainment base and the process of convergence between shopping, dining, and recreation activities<sup>iv</sup>, this improve the visitors stay time in the mall, provides an engaging environment, and also contributes to the formation of strong bonds, positive experience, and loyalty between the mall and its visitors. In order to conduct the shopping and entertainment process in this contemporary way, various elements must be provided for the comfort and

pleasure of the visitors to conduct the shopping and entertainment process, which in its turn are a positive reflection on visitor numbers and lead to a new visit as well as a long stay which leads to boost visitor purchases, hence increasing visitors' purchases enhancing tenants' profits for stores in the mall and increasing their ability to paying the mall owners' dues, and then increasing investments in the field of malls and opening new branches, and thus leads to enhancing the mental and visual image of the mall as well as the positive reputation, which helps the mall's success in light of the great competition climate. Dining is one of the most significant causes of visiting malls<sup>vi</sup>, to excel in the competition in the field of (PDS) and malls so the satisfaction and pleasure of visitors is the most important factor<sup>vii</sup>. The International Council of Shopping Centers indicates the percentage of visitors to malls with distinctive (PDS) rises by 20%. M-R model explores the three-way relationship between first: the elements of the physical environment, second: the elements of different user emotions (UE) and the various reactions of users, third: the behaviors of approach or avoidance (BI), and confirms that the relationship between these elements is a reciprocal relationship<sup>viii</sup>, Wells, Et al. (2015) proffer that M-

R model has been used in many studies dealing with different types of buildings, malls, markets, banks, and restaurants<sup>ix</sup>. Physical environment constructs have been covered in various studies; generally, the physical environment is the decoration, ambience and furniture layout<sup>x</sup>. The (PDS) colours and its visitors influences examined<sup>xi</sup>, additionally, sounds/music in (PDS) investigated<sup>xixxiiiixivxvixvixvii</sup>.

The current study adopted the most important physical environment/ behavior intentions factors for food according to (Rabboh, 2020)<sup>xviii</sup>; the adopted (PDPEE) is interior design mood (IM), finishing materials (FM), lighting (LT), furniture & fixtures (FF) and finishing colors (FC). Additionally, the study is an extension for previous study and the results of it used as a basis for the current study. The different emotions states and their effect on satisfaction on the physical environment studied<sup>xix</sup>. Mehrabian, Et al. developed a model for the elements of emotion states (ES), consisting of (Arousal, Pleasure), they also suggested 4 sub-components of the two main components, They recommended a third element, which is Dominant, Bakker, Et al. (2014) suggest abbreviating these elements in the first two components only<sup>xx</sup>. Different emotions and their impact on satisfaction on the physical environment were studied<sup>xxi</sup>. After reviewing the literature of the various types of emotions in architectural spaces, the current study adopted the most important factors affecting (PDS) visitors, namely comfort, pleasure<sup>xxii</sup>, because these elements are appropriate to the nature of (PDS). The retailing sector has been expanded steadily in the last decade in Egypt, although the revolutions and financial difficulties that Egypt has undergone, the growth rate has been adversely affected by 15-20%, the retailing investment sector has risen by 15-20%<sup>xxiii</sup>, few studies have been conducted on the (PDS) in Cairo region<sup>xxiv</sup>, The modern trends in environmental design for (PDS) considered and discussed. The correlation between the gender and shopping experience reviewed<sup>xxv</sup>. Malls' visitors' satisfaction and patronage intentions illustrated<sup>xxvi</sup>.

Enhancing shopping experience in malls has been extensively examined<sup>xxvii</sup>, some modern systems for serving restaurant's visitors in (PDS) have been discussed<sup>xxviiiixix</sup>, visitors' opinions in (PDS) have been tested<sup>xxxxxxxi</sup>. To date, few field studies focus on measuring the end-user opinion of public buildings, 90% of the mall visitors spend in the (PDS) for at least a quarter of an hour, likewise, 63% of the people surveyed in a 2015 study showed their appreciation for distinctive interior

and architectural design<sup>xxxii</sup>, based on the foregoing, the research objectives are:

This study aims to elucidate the opinion of (PDS) visitors about the priorities and importance of (PDPEE), In order to assist the architects in the architectural and interior designer of (PDS), in terms of understanding the end-users' views of (PDPEE) priorities, determining the correlation of the physical environment with the positive emotional influences, The physical relationship that increases the positive emotions, realization the relationship of the physical environment with the positive emotions as well as behavioural trends in terms of frequency or avoidance of the (PDS) spaces.

### 1.1 Study contribution

The current paper provides a different approach to measuring the priorities of the physical environment based on end-users point of view, as well as measuring (PDPEE) relation to the formation of positive emotions towards the (PDS), leading to an understanding of the architects of the priorities of users, In order to improve the architectural and interior designs of (PDS) in the upcoming years. Previous studies examine physical environment constructs for various building types<sup>xxxiii</sup>; however, for (PDS) few studies investigate it.

### 1.2 Objectives, questions & Hypothesis development

The hypotheses of the study were developed via proposing study questions, through answering them the study objectives are reached, in order to answer these questions, a conceptualization of the hypotheses was developed. Surveying the visitors' opinion on the priorities of (PDPEE) is the objective of the first question, while the second question measures the relationship between the (PDPEE) and the (ES), the third question tests the correlation between demographic characteristics and the previous visit (PV), the visit day (VD) week-days (WD) or week-ends (WE) and the time of the visit (VT) Morning or evening, emotions of comfort (CE) and the emotions of pleasure (PE). The fourth question identifies the relationship between (PDPEE) and visiting behaviors (BI) and the (ES), the study questions and Hypothesis as follows:

**Q1.** What is the visitors' prioritization of (PDPEE)? To answer this question the study hypothesized that, **H1:** The aesthetics element of (PDPEE) rated positively than function elements.

**Q2.** What is the relationship between the (PDPEE) and (ES)? This question replied via hypothesized that, **H2:** The (PDPEE) have a users' positive

(ES).

The study proposed a theoretical model as in figure (1) to responding to the following Hypothesis.

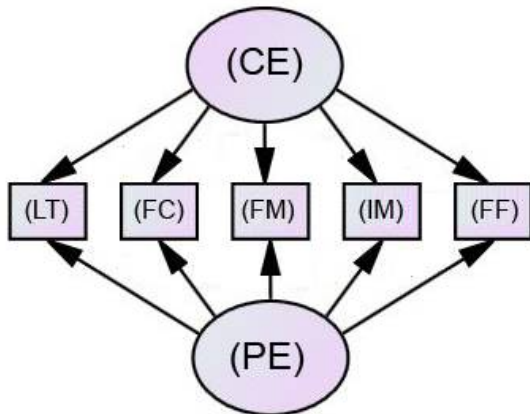


Figure (1) the proposed theoretical model represents the correlation between (PDPEE), (ES), Source (author).

**H2a:** There's a correlation between (IM) and comfort emotion (CE) of (PDPEE).  
**H2g:** There's a correlation between (FF) and comfort emotion (CE) of (PDPEE).

**H2b:** There's a correlation between (IM) and pleasure emotion (PE) of (PDPEE).  
**H2f:** There's a correlation between (LT) and pleasure emotion (PE) of (PDPEE).

**H2c:** There's a correlation between (FM) and comfort emotion (CE) of (PDPEE).  
**H2h:** There's a correlation between (FF) and pleasure emotion (PE) of (PDPEE).

**H2d:** There's a correlation between (FM) and pleasure emotion (PE) of (PDPEE).  
**H2i:** There's a correlation between (FC) and comfort emotion (CE) of (PDPEE).

**H2e:** There's a correlation between (LT) and comfort emotion (C.E.) of (PDPEE).  
**H2j:** There's a correlation between (FC) and pleasure emotion (PE) of (PDPEE).

**Q3.** Is there's a correlation between Demographic characteristics and visit states/ (ES)?

The following Hypothesis utilized to answer Q3:

**H3a:** There's a correlation between gender and comfort emotion (CE) of (PDPEE).  
**H3f:** There's a correlation between prior visit (PV) and pleasure emotion (PE) of (PDPEE).

**H3b:** There's a correlation between gender and pleasure emotion (PE) of (PDPEE).  
**H3g:** there's a correlation between visit day (VD) and comfort emotion (CE) of (PDPEE).

of (PDPEE).

**H3c:** There's a correlation between age and comfort emotion (CE) of (PDPEE).  
**H3h:** There's a correlation between (VD) and pleasure emotion (PE) of (PDPEE).

**H3d:** There's a correlation between age and pleasure emotion (PE) of (PDPEE).  
**H3i:** There's a correlation between (VT) and comfort emotion (CE) of (PDPEE).

**H3e:** There's a correlation between prior visit (PV) and comfort emotion (CE) of (PDPEE).  
**H3j:** There's a correlation between (VT) and pleasure emotion (PE) of (PDPEE).

**Q4.** Is there a relationship between (PDPEE)/(BI)/(ES)?

To reply to this question the study hypothesized that:  
**H4:** There's a relationship between (PDPEE)/(BI)/(ES).

**2. Study Methods**

In order to take the opinion of the visitors of (PDS) about the priorities of (PDPEE) and the (ES) related to it, the literature was reviewed, and based on this literature the key elements of the physical environment were identified, as well as the appropriate emotions for it. The above were transformed into hypotheses for the study and then these hypotheses were translated into questions, the opinion of visitors was questioned.

**2.1 Questionnaire administration**

Initially, a test questionnaire was designed and distributed to visitors to the (PDS) to measure the success of the questionnaire and the visitors 'understanding of the questions. The initial questionnaire was tested by the Cronbach Alpha test to measure the internal stability of the questionnaire; there are various tests that measure the internal stability and validity of questionnaires. The Cronbach alpha test is the most commonly used test for measuring responses of multi-component questions<sup>xxxxivxxxxvxxxxvixxxxviii</sup>. Then, the questionnaire was developed in the form of a final questionnaire that was relied upon in the current study. The questionnaire consists of 3 parts, the first is the demographic data of the respondents, the second: the respondents prioritize of (PDPEE) according to their point of view, and third: the respondent expresses his agreement to the mutual correlation between (PDPEE) and (ES). This part consists of 10 questions formulated by Semantic differential scale, which is a seven-scale scale starting from strongly agree and end with absolutely disagree, with an eighth choice (I don't know) to avoid



random choice.

**2.2 Statistical society & sampling and data collection**

Based on Ramko's rule, which clarified that at least the number of questionnaire fillers should be 10 times the study variables<sup>xxxix</sup>, these variables are represented in the form of questionnaire questions. The questionnaire questions consist of two parts: The first part is a single question on the priority order of (PDPEE), while the second consists of 10 questions about the association of (PDPEE) to (ES), so the study variables 11 variables were expressed in 11 questions. 224 visitors answered the questionnaire, so the percentage is 20.36, which is more than 10 times. In the period from 10/23/2019 to 7/11/2019 the questionnaire was circulated. The study was conducted in Greater Cairo, (30.0444 ° N, 31.2357 ° E), 6 (PDS) were selected in various geographical areas; these (PDS) are located in 6 of the most significant commercial centers in Cairo, Egypt.

**2.3 Sample characteristics**

The questionnaires respondents explained their demographic profile; the percentage of males was 48.5%, whereas females percentage was 51.5%, which revealed that the questionnaire is distributed in a balanced manner to avoid gender bias, which is influence the gender-based results. Regarding the age of the respondents in the questionnaire, the age periods and participation ratios were as follows: A) from 18 to 30 years 69.6%, B) from 31 to 45 years 32.2%, C) from 46 to 60 years 6.3%, D) bigger than 60 years 0.9%.

**2.4 Data analysis and reliability**

SPSS v.20, AMOS v.26 utilized in results' analysis and reliability testing. Anderson Et al. proposed two steps approach to fulfill data analysis, I-Confirmatory factor analysis (CFA), II-Structure equation model (SEM)<sup>xlxlxlii</sup>, the present study adopted the previous approach. Alpha Cronbach was tested for the elements of the initial questionnaire, and the test score was 70%, while the test score in the final questionnaire was 90%. In general, the acceptable value for this test is 0.70 or more<sup>xlxlxliv</sup>. Likewise, confidence intervals were mentioned alongside P-value, and so was the effect size that was used in addition to the chi-Square test.

**3. Results**

**3.1 The users' prioritization of (PDPEE)**

To determine (PDPEE) priorities from the users' point of view, in the second part of the questionnaire users were asked to prioritize (PDPEE) according to a five-point scale so that 1 expresses the first priority, and finally 5 expresses the fifth priority. The (PDPEE) priorities from the point of view of users as in table (1):

To produce the final ranking of the (PDPEE) weighted point rating system used, the elements of the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> ranks multiplied by 5, 4, 3, 2, 1 point respectively, thus, the total points were accumulated, then the final ranking was achieved as shown in the table (2), obviously, the aesthetic elements of (PDPEE) (interior design mood, finishing materials, lighting, finishing colors) were evaluated more important than the functional elements (furnishings - tables - seats). Hence, the hypothesis **H1** is approved.

**Table (1) Users point of view of (PDPEE) priorities. Source (author).**

(PDPEE)	1st Priority	2nd Priority	3rd Priority	4th Priority	5th Priority
(IM)	21	19	12	19	14
(FM)	6	2	19	20	38
(LT)	28	32	19	2	3
(FF)	9	14	11	27	24
(FC)	21	18	24	17	6

**Table (2) Users point of view of (PDPEE) ranking. Source (author).**

(PDPEE)	Points					Total Points	Perc.	Ranks
(IM)	105	76	36	38	14	269	21%	3
(FM)	30	8	57	40	38	173	14%	5
<b>(LT)</b>	<b>140</b>	<b>128</b>	<b>57</b>	<b>4</b>	<b>3</b>	<b>332</b>	<b>26%</b>	<b>1</b>
(FF)	45	56	33	54	24	212	17%	4
(FC)	105	72	72	34	6	289	23%	2

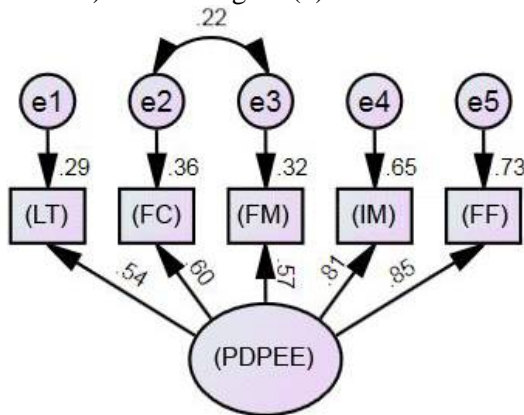
**3.2 The correlation between (PDPEE) and (ES)**

**3.2.1 Measurement model and confirmatory**

### factor analysis (CFA)

(CFA) defining the latent variables and their measures<sup>xlv</sup>. (CFA) and the measurement model utilized to investigate the correlation between the latent variables and measures<sup>xlvi</sup>.

The second part of the questionnaire contains rating (PDPEE), which are the elements that have been selected based on an extensive review of the literature related to the architectural elements of (PDS), and to test the importance of these elements, a measurement model was used, which includes the Factor loading for all the elements, and to consider the variables the value should be at minimum 0.40 (meaning  $\geq +0.4$  or  $\leq -0.4$ )<sup>xlvii</sup>, all factor loading was significant at 5% level of significance, obviously, the results demonstrate that all the variables are important variables, where the factor loading value ranges between (0.54-0.85) as in the figure (2).



**Figure (2): factor loading of (PDPEE). Source (author).**

Goodness is crucial part of the structural equation model (SEM)<sup>xlviii</sup>. Based on Fit indices extracted from (AMOS), there is a various type of goodness-of-fit (GOF) utilized to test the model fit, the main three categories as follows: Absolute measures, Incremental measures and Parsimonious measures<sup>xlix</sup>. The first absolute measures is (RMSEA)<sup>l</sup> the upper limit for (RMSEA) to show good fit is 0.08, the (RMSEA) value is 0.075, the second measure is goodness-of-fit index (GFI)<sup>li</sup>, the (GFI) value=0.985, the recommended value for (GFI) bigger than 0.90<sup>lii</sup>. Following the incremental measures for the proposed model, AGFI<sup>liii</sup> the criteria of good model means for AGFI should be bigger than 0.90, CFI, NFI, and TLI<sup>liv</sup> to achieve good fit it should be bigger than 0.95<sup>liv</sup>, the values of incremental measure in the present study as follows (AGFI=.942, CFI=.986, NFI=.976, TLI=.966), the Parsimonious fit measures utilized is  $\chi^2/df$ <sup>lv</sup>, the approved model fit for  $\chi^2/df < 5$ <sup>lix</sup>, the value of  $\chi^2/df$  in the study=2.24. All model-fit-indices fit to the study data, this mean that the study proposed model is a

good model.

### 3.2.2 Structure model based on (AMOS) software

Consequently, after conduction of the measurement model the structure equation model (SEM)<sup>lx</sup> utilized, (SEM) is used in order to validate the hypothesis theoretical model and to assess whether it fits with the data used by the questionnaire<sup>lxi</sup>, additionally, (SEM) is used in testing the causality correlation of theoretical models<sup>lxii</sup>. Spearman test used to inspect non-parametric data, whether the standardize coefficient is positive this mean there's a positive correlation and vice versa<sup>lxiii</sup>, in order to investigate the correlation between two variables standardized regression weights (i.e., beta coefficients) widely used<sup>lxiv</sup>. In Spearman's test, if the value of the standard coefficient is close to  $\pm 1$ , this means that there is an association between the measured variables, however, if the result is zero this means that there is no association<sup>lxv</sup>, while the value of the standard coefficient illustrates the strength/weakness of the relationship, based on its proximity or distance from  $\pm 1$ <sup>lxvi</sup>, the current hypotheses were tested by the following calculations, the T-statistics value which was computed from Bootstrap for Coefficients and the hypothesis is accepted if the *t*-value is greater than 1.96 and the *p*-value is less than 0.05, at the significant level 0.05, bootstrapped confidence intervals (BCI) limits values do not reach zero and vice versa<sup>lxvii, lxviii</sup>.

spearman test reject the independence of the variables (PDPEE) and users emotions states (ES), Hence, **H2** is proven because of standardized coefficient ( $\beta=0.561$ ), (*p*-value =0.00<0.05), (*t*-value=9.961). Further, (BCI) not cross zero (0.469, 0.795). This means the more positive assessment for (PDPEE) the more positive emotions are.

As for the detailed (PDPEE) and establishing the relationship between them and emotions, Spearman's test was used to find out the various relationships, Relationship between (IM) and the comfort is the hypothesis **H2a**, which is approved hypothesis, as the values are as follows ( $\beta=0.362$ ), (*p*-value=0.000), (*t*-value=3.709). (BCI) cross zero (0.178, 0.583), the relationship between (IM) and pleasure does not exist as the values are as follows: ( $\beta=0.080$ ), (*p*-value=0.412), (*t*-value= 3.389), the (BCI) cross zero (-0.122, 0.296), and thus the **H2b** hypothesis is a rejected hypothesis.

The test values for the relationship between (FM) and rest are as follows ( $\beta=0.114$ ), (*p*-value=0.261), (*t*-value=1.127). In addition to the (BCI) cross zero (-0.091, 0.334), and hence the **H2c**

hypothesis is a rejected hypothesis, in terms of the relationship between (FM) and pleasure, the test results were as follows: ( $\beta=0.342$ ), ( $p\text{-value}=0.001$ ), ( $t\text{-value}=3.389$ ). Additionally, the (BCI) cross zero (0.153, 0.580), hence the **H2d** hypothesis is acceptable. Regarding the association between (LT) for users and comfort, which is indicated by the hypothesis **H2e**, so the test values are as follows: ( $\beta=0.046$ ), ( $p\text{-value} = 0.632$ ), ( $t\text{-value}= 0.479$ ), the (BCI) cross zero (-0.175, 0.288), and these values indicate that the **H2e** hypothesis is rejected. In addition to the above, the **H2f** hypothesis examines the relationship between (LT) and pleasure, and the test values are as follows, ( $\beta=0.414$ ), ( $p\text{-value}=0.000$ ), ( $t\text{-value}=4.352$ ), the (BCI) don't cross zero (0.262, 0.696), and these values indicate that the **H2f** hypothesis is acceptable.

To prove the relationship between (FF) and comfort emotions (CE), the **H2g** hypothesis was tested, which turned out to be a valid hypothesis, as the values are as follows: ( $\beta=0.333$ ), ( $p\text{-value}=0.001$ ), ( $t\text{-value}=3.494$ ), (BCI) don't cross zero (0.159, 0.570), the relationship between (FF) and pleasure is represented in the hypothesis **H2h**, which was found to be rejected by the results, and the results are as follows: ( $\beta=0.118$ ), ( $p\text{-value}=0.216$ ), ( $t\text{-value}=1.242$ ), in addition to (BCI) cross zero (-0.076, 0.335).

**H2i** hypothesis expresses the correlation between (FC) and comfort, and it is an acceptable hypothesis, as the result of the tests is as follow: ( $\beta=0.292$ ), ( $p\text{-value}= 0.002$ ), ( $t\text{-value}=3.069$ ). Besides, (BCI) cross zero (0.110, 0.505), the relationship between (FC) and pleasure is a positive relationship and the hypothesis **H2j** is acceptable as the values are as follows: ( $\beta=0.228$ ), ( $p\text{-value}= 0.018$ ), ( $t\text{-value}=2.391$ ). Then, the (BCI) cross zero (0.042, 0.435). Figure (3) illustrate (PDPEE)'s SEM.

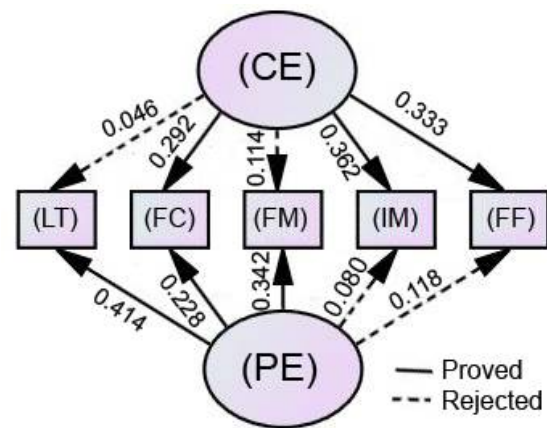


Figure (3) (SEM) of (PDPEE). Source (author).

### 3.3 Demographic characteristics and visit states/(ES) correlation

The association between the study variables tested via Chi-square test<sup>lxix</sup>, the effect size utilized to examine the amount of effect which does not shown in the significant test, three measure utilized to test effect size of chi-square test, Phi ( $\phi$ ), Cramer's V (V), and odds ratio (OR). Phi ( $\phi$ ) value utilized in the current study, when Phi ( $\phi$ ) value  $\leq 0.1$  considered as small effect, Phi ( $\phi$ )  $\leq 0.3$  is considered as medium effect, Phi ( $\phi$ )  $\leq 0.5$  is considers as large effect<sup>lxix</sup>. In table (3) the values of chi square test and effect size ( $\phi$ ) value.

Table (3) shows that all associations did not correlate, except four associations in which  $p\text{-value}$  was less than 0.05, which is the relationship of comfort emotions of (PDPEE) and age, That is, there is a relationship and effect between age and a comfort emotions (CE) resulting from (PDPEE), since  $p\text{-value}$  is (0.018), likewise, the effect size is large, as ( $\phi$ ) (0.732), in addition to the relationship between (CE) and the visit day (VD) week-days (WD)/week-ends (WE) is a strong relationship with respect to comfort since  $p\text{-value}$  (0.000) and the effect size ( $\phi$ ) is (0.576), and for emotions of pleasant  $p\text{-value}$  (0.008) And ( $\phi$ ) (0.522), The last correlation that has been proven the relationship between (VT) and emotions of comfort resulting from (PDPEE), it proved to be a strong relationship, the results of the tests were as follows:  $p\text{-value}$  (0,000) and ( $\phi$ ) (0.539). Based on the above, the hypotheses have not been proven except for the following hypotheses: H3c, H3g, H3h and H3i.

Table (3) Chi square test for demographic characteristics/(VD)/(VT) vs. (PDPEE)/(ES).

	Gender		Age		(PV)		(VD)		(VT)	
	$p\text{-value}$	( $\phi$ )	$p\text{-value}$	( $\phi$ )	$p\text{-value}$	( $\phi$ )	$p\text{-value}$	( $\phi$ )	$p\text{-value}$	( $\phi$ )
(CE)	0.193	0.408	<b>0.018</b>	0.732	0.488	0.376	<b>0.000</b>	0.576	<b>0.000</b>	0.539
(PE)	0.726	0.379	0.616	0.688	0.321	0.442	<b>0.008</b>	0.522	0.104	0.464

### 3.4 The full correlation between physical environment/(BI)/(ES)

#### 3.4.1 The correlation between (PDPEE) and (BI)

It is evident from Spearman's test that the correlation between the assessment of users' of (PDPEE) and the behavior intentions is high, where  $\beta=0.595$ , likewise,  $p\text{-value}=0.00 < 0.05$  and  $t\text{-value}=10.878 > 1.96$ , moreover, (BCI) do not cross zero (0.565, 0.808). All the above indicates the close relationship of the visitors' assessment of (PDPEE) and the desire to revisit the (PDS) again in the future.

#### 3.4.2 The association between (BI)/(ES)

Spearman's test confirmed that the relationship between positive emotions states and behaviors

intentions is high, where  $\beta=0.469$ ,  $p\text{-value}=0.000 < 0.05$ ,  $t\text{-value}=7.802 > 1.96$ , further, (BCI) do not cross zero (0.246, 0.473).

The two previous relationships clearly show the close and reciprocal relationship between (PDPEE), (BI) and (ES), which confirms the direct proportionality between users' evaluation of (PDPEE) as well as their positive emotions as well as their willingness to visit the (PDS) again. Because of the above, all (PDPEE) should be taken into consideration, according to the priorities indicated by the users' opinions in the first result. Hence, **H4** is proven. Table (4) illustrates methods, various statistical tests and results summary.

Table (4) Questions, hypotheses status summary.

Questions	Hypothesis	Statistical test	Significance test	Confirmation test	Hypothesis status
Q1	H1	Weighted points	N/A	N/A	Proved
Q2	H2	Spearman test	Beta coefficients ( $\beta$ ), p-value, t-value	Bootstrapped confidence intervals	Proved
	H2a				Proved
	H2b				Unproved
	H2c				Unproved
	H2d				Proved
	H2e				Unproved
	H2f				Proved
	H2g				Proved
	H2h				Unproved
	H2i				Proved
Q3	H3a	Chi-square test	Effect size	Phi ( $\phi$ )	Unproved
	H3b				Unproved
	H3c				Proved
	H3d				Unproved
	H3e				Unproved
	H3f				Unproved
	H3g				Proved
	H3h				Proved
	H3i				Proved
	H3j				Unproved
Q4	H4				Proved

## 4. Discussion & Conclusions

Emotions of (comfort-pleasure) were measured through a questionnaire in which an extensive review of the literature was conducted;

accordingly, (PDPEE) was summarized in five elements. The theoretical model was designed to measure the relationship between (PDPEE) and positive emotions states. Consequently, the



theoretical model was tested through the questionnaire technique that included with questions designed in a final questionnaire as a result of a pilot questionnaire, the quality of the questions and the internal consistency of the questionnaire was confirmed in its two stages by the Alpha Cronbach test, and the results of the questionnaire were analyzed through two steps:

**I.** A confirmatory factor analysis (CFA) of a measurement model, in which the importance of the questions was confirmed with a factor loading not less than 0.54, goodness-of-fit is rated at 3 categories as follows: Absolute measures, Incremental measures and Parsimonious measures, these categories consist of the following measures: (GOF), (RMSEA), (GFI), (CFI), (NFI), (TLI) and ( $\chi^2/df$ ), in the current study all this measure larger than the accepted cut-off.

**II.** The structural equation model (SEM) was used to measure the structure model resulting from the measurement model.

Spearman's test was also used to measure the relationships and prove the hypothesis **H2**, and this hypothesis was generally proven by the value of the standardized coefficient ( $\beta=0.561$ ), ( $p$ -value= $0.00 < 0.05$ ), ( $t$ -value= $9.961 > 1.96$ ), which indicates the close relationship between the positive emotions of comfort and pleasure resulting from (PDPEE), regarding the measurement of the detailed elements of (PDPEE) as follows:

From the results, it became clear that the aesthetic elements of (PDPEE) such as (lighting, interior design mood, finishing materials, etc.), attract the attention of visitors and attract them more than the functional elements. Thus, the first question (Q1) in the study was answered through weighted point rating system, hence the hypothesis **H1** is confirmed.

With regard to the effect of (PDS) architectural elements on comfort, the following relationship of comfort was established (FC), (FF), and (IM), while the relations with (FM), (LT) were not proven. As for pleasure, the relationship between it and the following elements was proven: (LT), (FC) and (FM), while the relationship between pleasure and the elements (IM), (FF) It has not been proven, the above is consistent with the answer to the first question in the research, as visitors are positively affected by the aesthetic elements more than any other elements.

The correlation between (PDPEE) elements and frequency behaviors proved to be a high correlation, as well as the relationship between users' frequency behaviors and positive emotions

(CE), (PE), which supports the results of Moe, J. O., Et al. (2016)<sup>lxxi</sup>, Ali, F., Et al. (2016)<sup>lxxii</sup>.

The chi-Square test revealed the relationships between users characteristics and visit states and positive emotions states, for example: with regard to gender, there are no differences in the results of the questionnaire, therefore, the classification of respondents in terms of gender has not been taken into account and this is consistent with previous studies on shopping malls, residential buildings and office buildings<sup>lxxiii</sup><sup>lxxiv</sup> <sup>lxxv</sup><sup>lxxvi</sup>, many relationships also appeared in the results, for example relationships between emotions of comfort in (PDS) resulting from (PDPEE) and age/VD/VT, which confirms that different age groups affect comfort, this is consistent with some previous studies<sup>lxxvii</sup>, similarly, timing of the visit, whether in the morning or evening. The aforementioned explains that the morning visit is where the architectural details can be clearly observed as a result that the (PDS) is not crowded with visitors, while the opposite happens in the evening for whole (PDS) in general, and their perception of architectural aesthetics in particular, when the visits are not intense. As for the pleasure generated by (PDPEE), it was clear from the results that it is affected only by the visit during week-ends or week-days. It was evident from the measurement of Effect sizes where the value of ( $\phi$ ) was greater than 0.3 in all chi-Square tests, and the largest effect of ( $\phi$ ) was in the relationship between emotions of comfort and age, where the value of ( $\phi$ ) was 0.732.

#### **4.1 Theoretical implications**

The present study showed the possibility of using various statistical methods in contemporary studies, such as the measurement model, structure model, especially in architectural studies that include models and sub-elements of a major architectural system. The theoretical relationship between users' satisfaction with (PDPEE) and positive feelings of comfort and pleasure, as well as the close relationship between positive emotions, as well as frequent visits and long stays in the (PDS) have been demonstrated and proven. Comfort or pleasure, and by extension, the behaviors of the visiting are not affected by the gender of the visitor, and likewise, the previous visit does not affect (CE)/(PE) as well as Age, (PV) and (VT).

#### **4.2 Practical implications**

The huge significance of the elements of lighting, finishing colors, similarly, that lighting is the first element from the users' point of view, one of the most important results extracted from the study,

which indicates the importance of studying the elements of lighting in the (PDS) in particular and in all the spaces of the public buildings in general, This is followed by a study of colors, which demonstrates the importance of the chromatic evaluation of the current (PDS) and the extent of their impact on the positive emotions of visitors, thus the re-visit the public buildings, ultimately the huge promotion of the project and its success at the marketing level.

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