CHAPTER FIVE: FINDINGS AND ANALYSIS

5.1 Introduction

This research attempts to explore the teenagers' perception of safety in relation to non-political graffiti vandalism with reference to outdoor lighting levels in urban areas of Tehran. It is also to assess the related SCP variables known to impact on vandalism and graffiti occurrence, as well as to evaluate the environmental variables that correlate with the high degree of non-political graffiti vandalism damages.

In order to address the aims of the present study, this chapter first discusses any correlation between perception of safety, lighting level and non political graffiti vandalism occurrence and then focuses on how the selected urban environmental variables and SCP variables are associated with high degree of graffiti vandalism damages.

This chapter presents the analysis and discussion of the results from primary data and the findings are summarised to produce charts and tables to assist with comparative analysis for the performance evaluations.

5.2 Discussions of the Findings

5.2.1 Graffiti Vandalism and Lighting Level

The effectiveness of implementing some of the SCP variables such as lighting programs to prevent vandalism and graffiti depends on the time when vandalism and graffiti are likely to happen. To find out the effectiveness of implementing lighting initiatives (lighting vs. No lighting) in urban areas of Tehran, respondents were asked about the likely time of vandalism and graffiti occurrences (Table 5.1).

The result is important due to the current gap in research in understanding vandalism and graffiti on the influence of time in urban areas of Tehran.

Table 5.1: The likely time of vandalism and graffiti occurrences

variables		Lighting level & situation
Q10-1	Early at night (6pm to 12 mid night)	when it is dimly dark/ dark and there is night life
Q10-2	Night time (12 mid night to 6 am)	when it is completely dark but no night life[1]
Q10-3	Early day time (6 am to 9 am)	when it is dimly lit /completely lit and day life is starting
Q10-4	Day time (9 am to 6 pm)	when it is completely lit and there is day life

The responses from teenager students show that vandalism and graffiti are more likely to happen at night time (between 12midnight to 6 am) and early at nigh (between 6pm to 12 midnight) and consequently it worse investigating the effectiveness of implementing lighting initiatives. The following data presented in Table 5.2 shows the Friedman rank test[2] result. As the $\rho<0.05$ (Table 5.3), the Friedman test is positive and shows the variables are significantly different from which other variables.

Table 5.2: Friedman rank Test (Vandalism & graffiti / Likely Time of occurrence)

Factor	Mean rank
Q10-1: Early at night (6pm to 12 mid night)	2.55
Q10-2: Night time (12 mid night to 6 am)	**3.33**
Q10-3: Early day time (6 am to 9 am)	2.07
Q10-4: Day time (9 am to 6 pm)	2.06

Table 5.3:Test Statistics (Friedman Test) (Vandalism & graffiti / Likely Time of Occurrence)

N of Valid Cases	Chi-Square	df	Asymp. Sig.
480	359.473	3	**0.000**

significant at $\rho <0.05$

[1] According to regulations in Tehran, all business areas must be closed after 12 midnight. Only some businesses with permission from Tehran police department can be active after 12 midnight (Tehran municipality website)

[2]"Friedman Test is a non-parametric test (distribution-free) used to compare observations repeated on the same subjects. This is also called a non-parametric randomised black analysis of variance .This non parametric makes no assumption about the distribution of the data. The hypotheses for the comparison across repeated measures are:
H_o: The distributions are the same across repeated measures.
H_a: The distributions across repeated measures are different
The hypothesis makes no assumptions about the distribution of the populations. These hypotheses could also be expressed as comparing mean ranks across measures. The test statistic for the Friedman's test is a Chi-square with a-1 degrees of freedom, where a is the number of repeated measures. When the p-value for this test is small (usually <0.05) we have evidence to reject the null hypothesis. (www.texasoft.com).

The second part is re examination of the literature considering the social and environmental characteristics of urban areas in Tehran from the view of teenager students.

To have a general view on respondents' perception of safety and to explore if any differences exist between the level of perception of safety between two groups of male and female students in the area where they live and where they study, they were asked to rate how they concern their safety in both areas (Q1-1 & Q1-2). Table 5.4 (produced from running Mann-Whitney U test[3]) shows the number (N) of respondents in each group (male and female students), mean rank and sum of ranks when they replied to the questions.

Table 5.4 : Ranks (Perception of safety)

		Sex (group)	N	Mean Rank	Sum of Rank
Q1-1	Perception of safety in area of residence	Male	354	250.69	88743.00
		Female	148	253.45	37510.00
		Total	502		
Q1-2	Perception of safety in area of study	Male	351	235.51	82664.00
		Female	148	284.36	42086.00
		Total	499		

The second section of the output shows the values of the Mann-Whitney U test, Z, the ρ values [on the row labelled Asymp. Sig. (2-tailed)]. In question 1-1, since the exact Z (0.839) value is more than the 1.96 (Table 5.5), there is sufficient evidence to conclude that there is no difference between the level of perception of safety between two groups of male and female students in the area of residence. In question 1-2, since the exact Z (0.000) value is less than 1.96, there is sufficient evidence to conclude that the level of perception of safety between two groups of male and female students is different in the area of study.

[3] " The Mann-Whitney U Test is used to compare differences between two independent groups when the dependent variable is either (a) ordinal or (b) interval but not normally distributed. It is the nonparametric alternative to the independent t-test"(laerd Statistics. N.d.)

Table 5.5 :Test Statistics (Mann Whitney U test)/ Perception of safety

		Mann Whitney U	Z	Asymp. Sig. (2-tailed)
Q1-1	Perception of safety in area of residence	25908.000	-0.203	**0.839**
Q1-2	Perception of safety in area of study	20888.000	-3.580	**0.000**

Reject H0 if Z<-1.96 or Z>1.96[4]
N>20, α= 0.05
H0: There is no difference exist between the level of perception of safety between two groups of male and female students in area of residence/ area of study
Ha: There are differences exist between the level of perception of safety between two groups of male and female students in area of residence/ area of study

Prior research has found that perception of safety can be affected by a range of environmental factors such as lighting level in urban areas (Coumarelos, 2001). The following data presented in Table 5.6 & 5.7 is re examination of the literature when respondents were asked to rate their perception of safety in dark and lit places. The finding supports the existing literature and shows teenager students feel safer in lit places.

Table 5.6: Friedman rank Test (Perception of Safety & Lighting Level)

Question Items		Mean rank
Q5-1	Perception of safety in dark places	1.20
Q5-2	Perception of safety in lit places	**1.80**

Table 5.7:Test Statistics (Friedman Test) (Perception of Safety & Lighting Level)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
495	202.687	1	**0.000**

significant at ρ <0.05

[4] "When two samples are both large (N>20), the distribution of Mann Whitney U statistics tends to approximate a normal shape. In this case, the Mann Whitney Hypothesis can be evaluated using a Z score statistics and the unit normal distribution" (Gravetter & Wallnau , 2006, P.646).

The present survey looks closely at the differences between the perception of safety concerns of male and female students in dark and lit places. Table 5.8 shows the number (N) of respondents in each group (male students and female student) and mean rank for each group for question Q5-1 and Q5-2.

In question 5-1, since the Z (-2.697) is less than -1.96 (-2.697<-1.96), there is sufficient evidence to conclude that male students and female students have different perception of safety in dark places (Table 5.9).

In question 5-2, since the Z value is greater than -1.96 (-1.421>-1.96), there is sufficient evidence to conclude that male students and female students have no significant different perception of safety in lit places in urban areas of Tehran.

Table 5.8 : Ranks (Perception of Safety & Lighting Level/ Sex)

		Sex	N	Mean Rank	Sum of Rank
Q5-1	Perception of safety in dark places	Male	348	258.33	89898.00
		Female	146	221.69	32367.00
		Total	494		
Q5-2	Perception of safety in lit places	Male	349	253.11	88334.50
		Female	145	234.00	33930.50
		Total	494		

The second section of the output (Table 5.9) shows the values of the Mann-Whitney U test, the ρ values [on the row labelled Asymp. Sig. (2-tailed)].

Table 5.9:Test Statistics (Mann Whitney U test) (Perception of Safety & Lighting Level/ Sex)

Question items	Mann Whitney U	Z	Asymp. Sig. (2-tailed)
Q5-1	21636.000	-2.697	**0.007**
Q5-2	23345.500	-1.421	**0.155**

Reject H0 if Z<-1.96 or Z>1.96
N>20, α= 0.05
H0: There is no difference exist between the level of perception of safety between two groups of male and female students in area of residence/ area of study
Ha: There are differences exist between the level of perception of safety between two groups of male and female students in area of residence/ area of study

The respondents, who feel safer in lit places where asked why they feel safer in lit areas, based on past researches (Narisada & Scheruder 2004, Fennelly 2004, Fisher & Nasar 1992)., two factors have been suggested to help improving perception of safety in lit places:

1. *Better visibility*
2. *More number of people*

The data presented in Table 5.10 shows the Friedman rank test result. Since the $p<0.05$ (Table 5.11), the Friedman test is positive and shows teenager students stress the importance of good visibility to help them feel safer in well lit places.

Table 5.10: Friedman rank Test (perception of safety in lit places/ Causes)

	Factor	Mean rank
1	They feel safer in lit places because of better visibility	**1.58**
2	They feel safer in lit places because of the presence of more people	1.42

Table 5.11:Test Statistics (Friedman Test) (perception of safety in lit places/ Causes)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
323	13.413	1	**0.000**

significant at $\rho < 0.05$

The re examination of any correlation between lighting level and perception of safety from the view of respondents in urban areas of Tehran shows the importance of providing lighting to increase perception of safety among teenager students. However, it is important to investigate how and to what extent lighting initiatives are supported by respondents as having ability to improve perception of safety in urban areas of Tehran in comparison to five other SCP variables from the view of respondents. It helps to put more efforts on the most effective initiatives to improve perception of safety among respondents. The result from examination of any correlation between lighting level and graffiti occurrence and the result from this part will help to make decision on the best

solution to prevent graffiti as well as to improve perception of safety in urban areas of Tehran.

Based on SCP theory, 1) Responsibility of the residents toward what is happening in their neighbourhood, 2) Presence of police (police patrol) in the neighbourhoods, 3)Clean buildings without any evidences of vandalism, 4) Clean street furniture such as bus stations or dust bins without any evidences of vandalism,5) High quality of the lighting in the area and 6) Presence of more people in the neighbourhood are independent variables that contribute to increase perception of safety in a neighbourhood and a positive image of the neighbourhood and people.[5]

Spearman's Rank Correlation Test[6] is run on six variables to measure the degree of association between perception of safety and independent variables suggested by SCP theory. It is to determine how lighting initiatives is important to increase perception of safety among teenager students in comparison to other variables.

The result from table 5.12 revealed a clear relationship between three SCP variables and perception of safety from the view of respondents in urban areas of Tehran.

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[5] Although low crime rate is known as the most important factor to improve perception of safety among residents, however it has been experienced that the actual crime rate in a neighbourhood can never reflect the sense of security among residents (van den Berg, 2006) and the incidence of crime may not be as high as is sometimes perceived.

[6] "The Spearman's Rank Correlation Coefficient is used to discover the strength and direction of association that exists between two variables measured on at least an ordinal scale" Spearman's rank correlation coefficient allows to identify easily the strength of correlation within a data set of two variables, and whether the correlation is positive or negative (whether the slope of the corresponding line is positive or negative).Spearman's rank correlation coefficient requires data that are at least ordinal and the calculation, which is the same as for Pearson correlation, is carried out on the ranks of the data. Each variable is ranked separately by putting the values of the variable in order and numbering them. Spearman's rank correlation coefficient is used as a measure of linear relationship between two sets of ranked data, that is it measures how tightly the ranked data clusters around a straight line. Spearman's rank correlation coefficient, like all other correlation coefficients, will take a value between) 1 and +1. A positive correlation is one in which the ranks of both variables increase together. A negative correlation is one in which the ranks of one variable increase as the ranks of the other variable decrease. A correlation of (+1 or 1) will arise if the relationship between the two variables is exactly linear. A correlation close to zero means there is no linear relationship between the ranks.(Altman , 1990)

The findings indicated that presence of more people in the streets, high quality of lighting and responsibility of the residents toward what is happening in their neighbourhood correlated with respondent's perception of safety. Lighting was known as the second important factor to increase perception of safety among respondents.

Table 5.12: Degree of association between perception of safety and five other variables suggested by SCP to increase Perception of Safety from the view of teenager students in Tehran

	CPTED Variables	P	Confidence of correlation
1	responsibility of the residents toward what is happening in their neighbourhood	**0.021***	**.175**
2	presence of the police in the neighbourhood	0.754	.180
3	clean buildings without any evidences of vandalism	0.834	0.017
4	clean street furniture such as bus stations or dust bins without any evidences of vandalism	0.34	0.076
5	high quality of the lighting in the area	**0.015***	**.185**
6	presence of more people in the neighbourhood	**0****	**.453**
*p<0.05, **p<0.01 -1<ρ<+1			

The effects of lighting on perception of safety from the view of respondents indicated to undeniable role of lighting initiatives to improve perception of safety among respondents. The result should come into consideration when determining to implement lighting/ no lighting to prevent graffiti vandalism.

This part is to investigate how lighting correlated with occurrence of graffiti and vandalism. To find out any correlation between lighting level and vandalism (including graffiti) occurrences, respondents were asked to rate how different types of vandalism are likely to happen in areas with different lighting level as follows:

1. *Lit places*
2. *Dimly lit places*
3. *Dark places*

Table 5.13: Friedman rank Test (Vandalism Occurrence/ Lighting Level)

Factor	Mean rank
Lit places	1.46
Dimly lit places	2.01
Dark places	**2.53**

The data presented in Table 5.13 shows the Friedman rank test result. As the $\rho<0.05$ (Table 5.14), the Friedman test is positive and shows the variables are significantly different from which other variables. It is concluded that dark areas are more vulnerable to vandalism and lit places are the less vulnerable to vandalism.

Table 5.14:Test Statistics (Friedman Test) (Vandalism Occurrence/ Lighting Level)

N of Valid Cases	Chi-Square	df	Asymp. Sig.
466	320.711	2	**0.000**

significant at ρ <0.05

This part is re-examination of the literature on the importance of informal surveillance to prevent vandalism in urban areas of Tehran and also a comparison between the effectiveness of implementing lighting initiatives versus informal surveillance to prevent vandalism. First, it has been examined how vandalism is likely to happen in 2 areas as follows:

1. *less crowded places*
2. *Crowded places*

The following data presented in Table 5.15 shows the Friedman rank test result. As the $\rho<0.05$ (Table 5.16), the Friedman test is positive and shows the variables are significantly different from which other variables. The findings fully support situational prevention theory and indicate that less crowded places are more vulnerable to vandalism from the view of respondents in Tehran.

Table 5.15: Friedman rank Test (Vandalism/Likely Places of Occurrence)

Factor	Mean rank
Q11-1: Less crowded places	**3.86**
Q11-2: Crowded places	2.24

Table 5.16:Test Statistics (Friedman Test) (Vandalism/Likely Places of Occurrence)

N of Valid Cases	Chi-Square	df	Asymp. Sig.
474	150.537	1	**0.000**

significant at ρ <0.05

An investigation on vulnerability of five different places with different level of lighting and different level of informal surveillance, shows that vandalism is more likely to happen in less crowded places (low level of informal surveillance) rather than dark places. Moreover, lit places and then crowded places (high level of informal surveillance) identified as the least vulnerable places to vandalism. The following data presented in Table 5.17 shows the Friedman rank test result. Since the ρ<0.05 (Table 5.18), the Friedman test is positive.

The vulnerability of other variables to vandalism is prioritised as follows:

1- *Less crowded places*
2- *Dark places*
3- *Dimly lit places*
4- *Crowded places*
5- *Lit places*

Table 5.17: Friedman rank Test (Occurrence of vandalism & graffiti / Lighting Level/ Informal surveillance)

Variable	Mean rank
Less crowded places	3.86
Crowded places	2.24
Lit places	2.17
Dimly lit places	2.96
Dark places	3.77

Table 5.18:Test Statistics (Friedman Test) (Occurrence of vandalism & graffiti / Lighting Level/ Informal surveillance)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
456	551.679	4	**0.000**

significant at ρ <0.05

In line with the aim of the study, to investigate any correlation between lighting level and non political graffiti occurrence, respondents were asked to rate how graffiti is likely to happen in 3 pictures shown in Figure 5.1. The pictures were taken under the condition of different lighting levels (Lit, Dimly Lit, and Dark) from the same property. It helps to investigate how the existing lighting level effects on vulnerability of the target to graffiti vandalism regardless of the effects of other environmental variables[7]. Three level of lighting (High, Average and Low) presented to respondents.

It has been tried to explore which of the places is the most vulnerable place to graffiti vandalism. The following data presented in Table 5.20 shows the Friedman rank test result. Since the $\rho < 0.05$ (Table 5.21), the Friedman test is positive.

Table 5.19: Responses from teenager students:
How graffiti vandalism is likely to happen in 3 pictures (%)

Variables	Lighting level	Very Low (%)	Low (%)	Neither low nor high (%)	High (%)	Very High (%)
Lit (picture 1)	High	11.73	25.31	29.42	21.40	12.14
Dimly Lit (picture 2)	Average	6.27	13.96	29.57	29.57	20.33
Dark (picture 3)	Low	13.50	11.45	14.11	18.20	42.74

[7] The variables such as material, architecture design, size, glossiness , …

Figure 5.1: The pictures were taken under the condition of different lighting levels (Lit, Dimly Lit, and Dark) from the same property (see Appendix E)

Picture 1	
The colour and the material of the surface can be defined clearly	
Lighting level: **High**	
Picture 2	
The colour and material of the surface can be defined but not so clearly	
Lighting level: **Average**	
Picture 3	
If only the material but not colour of the surface can be defined	
Lighting level: **Low**	

The findings is consistent with the finding from table 5.13 & 5.14[8]and shows that dark places with low level of lighting are the most likely place to be vandalised by graffiti writers, while lit places with high level of lighting are the least likely places to be vandalised.

[8] Table 5.13 and 5.14 report on the correlation between all types of vandalism (including graffiti) and lighting level

Table 5.20: Friedman rank Test (Graffiti Occurrence/ Lighting Level)

Factor	Lighting Level	Mean rank
Picture.1	High	1.68
Picture.2	Average	2.05
Picture.3	Low	**2.27**

Table 5.21:Test Statistics (Friedman Test) (Graffiti Occurrence/ Lighting Level)

N of Valid Cases	Chi-Square	df	Asymp. Sig.
481	107.771	2	**0.000**

significant at $p<0.05$

5.2.2 Graffiti Vandalism, Urban Environmental Variables and SCP Variables

It is always the question why some buildings are so vulnerable to graffiti vandalism and are frequently and extensively targeted by vandals while some other buildings in the same area have never been vandalised by graffiti writers. This study is trying to investigate the causes of such happening in the role and importance of urban environmental variables and SCP variables root in physical and situational condition of the target.

To that aim, the SCP assessment conducted in 3 different urban areas of Tehran, is trying to examine how any of the related SCP variables to prevent vandalism and some urban design variables are highly correlated with degree of graffiti vandalism damages. Table 5.22 shows the number of graffiti vandalism occurrences assessed in 3 selected urban areas of Tehran. 160 samples have been assessed and documented in three areas of the city. 43.8% of all damages happened in area 3 and 40.6% of all damages happened in area 2.

Table 5.22 Number of graffiti vandalism occurrences assessed in 3 selected urban areas of Tehran

Areas	Numbers	**(%)**
Area 1	25	15.6
Area 2	65	40.6
Area 3	70	43.8
All areas	160	100

The assessment on each of the vandalised cases by graffiti writers is based on some criteria that is present explicitly and discussed in chapter 5.

In this research, all vandalism incidents have been categorised into 5 groups in terms of degree of damages. The criteria to assess each sample on the basis of degree of damages are presented in chapter five. Table 5.23 presents the number of properties targeted by graffiti writers in 3 areas according to degree of damages.

Table 5.23: Number of properties targeted by graffiti writers in 3 areas on the basis of degree of Damages

		Frequency	Percent	Valid percent
1	Very Low	5	3.1	3.1
2	Low	45	28.1	28.1
3	Average	84	52.5	52.5
4	High	24	15.0	15.0
5	Very High	2	1.2	1.2
	Total	160	100.0	100.0

This part first discusses if there is any correlation between four urban environmental variables and degree of graffiti vandalism damages in 3 selected areas of Tehran. Urban environmental variables studied in this study root in urban characteristics of the city[9] and comprise the following:

Types of building, Block Design, land use of the property, types of street

Pearson Chi square[10] test has been used to examine if there is any significant relationship between degree of graffiti vandalism damages and types of buildings, block design, types of streets and land use of the properties.

[9] See chapter 4

[10] The Chi-Square test for independence, also called Pearson's Chi-square test or the Chi-square test of association is used to discover if there is a relationship between two categorical variables. The assumption is that Two variables that are ordinal or nominal (categorical data). And there are two or more groups in each variable (laerd Statistics. n.d).

Table 5.24 shows the number of graffiti vandalism incidents base on the building types. The table shows that 53.8% of the graffiti vandalism incidents happened on the Northern Lots' facades.

Table 5.24 : Number of graffiti vandalism incidents assessed base on the building types in 3 selected areas of Tehran

	Types of buildings/ block design	Frequency	Percent	Valid percent
1	Northern Lot	**86**	**53.8**	**53.8**
2	Southern Lot	58	36.2	36.2
3	High-rise	0	0	0
4	Detached/Semi Detached	3	1.9	1.9
5	Fixed Street furniture	11	6.9	6.9
6	Others	2	1.2	1.2
	Total	160	100.0	100.0

The correlation between the types of building, block design and severity of damages has been examined using Pearson Chi Square test. The result from table 5.25 shows the values are independent as $\rho > 0.05$.

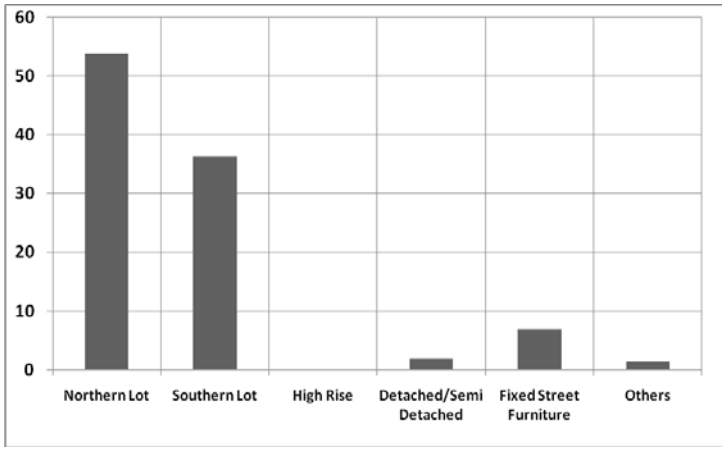

Figure 5.2: Number of graffiti vandalism incidents (%) assessed base on the building types/ block design in 3 selected areas of Tehran

Table: 5.25 Chi-Square Test (the degree of damages & Type of buildings, block design)

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.520	16	**0.776**
N of Valid Cases	160		
significant at $\rho < 0.05$			

Table 5.26 presents the number of graffiti vandalism incidents base on the Land use of the property in 3 selected areas of Tehran. As it shows the residential buildings had been the main target of graffiti writers. The Pearson chi square result from table 5.27 shows there is no correlation ($\rho > 0.05$) between the land use of the property and severity of graffiti vandalism damages.

Table 5.26: Number of graffiti vandalism incidents base on the Land Use of the property in 3 selected areas of Tehran

	Land Use	Frequency	Percent	Valid percent
1	Residential building	**132**	**82.5**	**82.5**
2	Parks , Landscapes,	0	0	0
3	Shops	7	4.4	4.4
4	Institute, office	21	13.1	13.1
	Total	160	100.0	100.0

Table: 5.27 Chi-Square Test (Degree of damages & land use of the buildings)

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.189	8	**0.975**
N of Valid Cases	160		
significant at $\rho < 0.05$			

Table 5.28 presents the number of graffiti vandalism incidents based on different types of streets. Some photos of different types of streets are presented in figure 5.2.

It shows the highest number of graffiti damages occurred in main streets type 2 and side streets type1 but the Pearson chi square test from table 5.29 shows that the types of streets and degree of damages are two independent values.

Table 5.28: Number of graffiti incidents based on different types of streets in 3 selected areas of Tehran

	Types of streets	Frequency	Percent	Valid percent
1	High way	2	1.2	1.2
2	Main street 1	4	2.5	2.5
3	Main street 2	**79**	**49.4**	**49.4**
4	Side street 1	**69**	**43.1**	**43.1**
5	Side street 2	2	1.2	1.2
6	Blind alley	4	2.5	2.5
	Total	160	100.0	100.0

Table 5.29 Chi-Square Test (the degree of damages & Type of streets)

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.540	20	**0.552**
N of Valid Cases	160		

significant at ρ <0.05

Figure 5.3: Different Types of streets in Urban areas of Tehran

High way

Main street 1

Main street 2

Side street 1

Side street 2

Blind alley

The second part of the study describes the 160 samples from 3 selected urban areas of Tehran and then examines how any of the related SCP Variables to prevent vandalism and graffiti is highly correlated with degree of non political graffiti damages.

Q.6 lighting level

The assessment shows that almost all vandalised properties had been lit by street lights, even though different light sources have been used to light the streets in Tehran. The criteria to assess the lighting level presented in chapter five of this research.

Table 5.30 presents the number of graffiti vandalism occurrences based on the lighting level in three selected areas.

It shows that 56.2% of all assessed graffiti vandalism occurrences was in places with average lighting level and 34.4 % of graffiti vandalism occurrences was in places with low level of lighting while there is no evidences of graffiti vandalism in places with very low or very high level of lighting. The finding is inconsistent with the findings from the survey presented in part 5.2.1 of this chapter[11]. The causes of such contrasting and the evidences of no graffiti vandalism occurrences in very low and very high level of lighting should be discuss considering the impact of other SCP variables on degree of graffiti vandalism damages and also on available lighting level in urban areas of Tehran[12].

[11] The findings from part 5.2.1 shows the effects of lighting to prevent vandalism when among all environmental variables, lighting is the only determining factor.

[12] As discussed before, because of the existence of lighting pools in all streets lighting is available in nearly all places. In selected areas, there was no places with very low lighting level

Table 5.30: Number of graffiti vandalism occurrences based on the lighting level in three selected areas.

	Light level	Frequency	Percent	Valid percent
1	Very Low	0	0	0
2	Low	55	34.4	34.4
3	Average	**90**	**56.2**	**56.2**
4	High	15	9.4	9.4
5	Very High	0	0	0
	Total	160	100.0	100.0

Q.7 Glossiness of the vandalised facades

Vandalised properties have been assessed to define if glossiness of the surfaces is correlated with degree of graffiti vandalism damages. The result showed that 84.4% of all vandalism incidents happened on surfaces with unpolished materials such as brick, unpolished travertine and cement rendered with not very polished surfaces. Table 5.31 presents the number of graffiti vandalism incidents based on different glossiness level of the surfaces.

Table 5.31: Number of graffiti vandalism incidents based on different glossiness level of the surfaces

	Glossiness level	frequency	Percent	Valid percent
1	Very Low	0	0	0
2	Low	**135**	**84.4**	**84.4**
3	Average	22	13.8	13.8
4	High	3	1.9	1.9
5	Very High	0	0	0
	Total	160	100.0	100.0

Q.8 Size of the surface

The size of the vandalised surfaces has been assessed to evaluate how availability of the targets correlated with degree of graffiti vandalism damages. The criteria to assess the size of the vandalised facade are presented in chapter five. The result from samples shows that the broad and relatively broad surfaces have been more encouraging to graffiti writers.

Table 5.32: Number of graffiti occurrences based on the broadness of the surface

	Broadness	Frequency	Percent	Valid percent
1	Very Low	2	1.2	1.2
2	Low	18	11.2	11.2
3	Average	**71**	**44.4**	**44.4**
4	High	**62**	**38.8**	**38.8**
5	Very High	7	4.4	4.4
	Total	160	100.0	100.0

Q.9 The lightness of the colour

The colour of the vandalised surfaces by graffiti writers has been assessed to evaluate how lightness level of the colour as one of the SCP variables to attract vandals are correlated with degree of graffiti vandalism damages. The result from the samples shows that the colours with high and average level of lightness have been more encouraging to vandals while there is no evidence of graffiti vandalism on surfaces with very low level of lightness (Table 5.33).

Table 5.33: Number of graffiti vandalism damages on the basis of lightness level of the colours

	Size & Colour	Frequency	Percent	Valid percent
1	Very Low	0	0	0
2	Low	1	0.6	0.6
3	Average	**71**	**44.4**	**44.4**
4	High	**79**	**49.4**	**49.4**
5	Very High	9	5.6	5.6
	Total	160	100.0	100.0

Q.10 & Q.11 The level of informal surveillance: The risk of being seen by people in the place (Day time/ Night time)

Q.10 and Q.11 assess the risk of being seen by people at day time and night time. These questions are trying to find out how presence of people as one of SCP variables to provide informal surveillance correlated with high degree of graffiti vandalism damages. The criteria to assess the informal surveillance of the place are presented in

chapter five. Table 5.34 and 5.35 present the level of informal surveillance provided by presence of people at day time and night time.

Table 5.34: Number of graffiti vandalism damages on the basis of level of informal surveillance provided by presence of people at day time

	Risk level	Frequency	Percent	Valid percent
1	Very Low	0	0	0
2	Low	0	0	0
3	Average	**79**	**49.4**	**49.4**
4	High	**75**	**46.9**	**46.9**
5	Very High	6	3.8	3.8
	Total	160	100.0	100.0

Table 5.35: Number of graffiti vandalism damages on the basis of level of informal surveillance provided by presence of people at night time

	Risk level	frequency	Percent	Valid percent
1	Very Low	0	0	0
2	Low	**128**	**80.0**	**80.0**
3	Average	31	19.4	19.4
4	High	0	0	0
5	Very High	1	0.6	0.6
	Total	160	100.0	100.0

Table 5.35 shows that vandalism were more likely to occur in places with low level of informal surveillance at night time while it seems the presence of people at day time that provide high and average level of surveillance in the place didn't stop graffiti writers of committing crime (table 5.34). It is consistent with previous findings showing that vandalism is more likely to happen at night time and low level of surveillance at night time lead to more graffiti occurrences.

Q.12 & Q.13 The level of informal surveillance: The cars' traffic at day time and night time

Car traffic at day time and night time can provide informal surveillance to prevent graffiti and vandalism[13]. The criteria to assess the traffic of the cars in the place are presented in chapter five. Table 5.36 and 5.37 show that the cars' traffic at day time and night time.

[13] "Car traffic increase informal surveillance and enhances community safety"(Department for Transport, UK ,2011)

The findings showed that graffiti vandalism damages are more likely to occur in places with low level of traffic at night time (70%) while the level of traffic of the cars at day time could not stop vandals of committing crime by providing informal surveillance. The likely time of graffiti occurrences as discussed in Q.10& Q.11 can justify such findings.

Table 5.36: Number of graffiti vandalism damages on the basis of level of informal surveillance provided by cars' Traffic at day time

		frequency	Percent	Valid percent
1	Very Low	0	0	0
2	Low	1	0.6	0.6
3	Average	**74**	**46.2**	**46.2**
4	High	**77**	**48.1**	**48.1**
5	Very High	8	5.0	5.0
	Total	160	100.0	100.0

Table 5.37: Number of graffiti vandalism damages on the basis of level of informal surveillance provided by cars' Traffic at night time

		frequency	Percent	Valid percent
1	Very Low	1	0.6	0.6
2	Low	**112**	**70.0**	**70.0**
3	Average	44	27.5	27.5
4	High	3	1.9	1.9
5	Very High	0	0	0
	Total	160	100.0	100.0

Q.14 Visibility of vandalised facade to people

The visibility of the target to people has been assessed to find out if the location of the target is correlated with degree of graffiti damages. The assessment showed that, 46.2% of all damages happened to facades that were at high visibility to people. This may root in different nature of graffiti vandalism with other types of crime.

Table 5.38: Number of graffiti vandalism damages on the basis of level of visibility of vandalised property to people

		frequency	Percent	Valid percent
1	Very Low	2	1.2	1.2
2	Low	18	11.2	11.2
3	Average	64	40.0	40.0
4	High	**74**	**46.2**	**46.2**
5	Very High	2	1.2	1.2
	Total	160	100.0	100.0

Q.15 Level of formal surveillance: Police patrol/ Security Guard

The level of informal surveillance in the area has been assessed based on the criteria presented in chapter five. The result from assessment shows that 72% of graffiti vandalism damages occurred in places where the informal surveillance is low. It is consistent with situational prevention theory to prevent crime by providing formal surveillance.

Table 5.39: Number of graffiti vandalism damages on the basis of level of informal surveillance

		frequency	Percent	Valid percent
1	Very Low	28	17.5	17.5
2	Low	**72**	**45.0**	**45.0**
3	Average	38	23.8	23.8
4	High	22	13.8	13.8
5	Very High	0	0	0
	Total	160	100.0	100.0

Q.16 Width of Street

Table 5.40 present the number of graffiti vandalism damages based on width of streets. It is to find out if width of streets that roots in urban design of the areas is correlated with degree of vandalism damages. It helps to find out the most vulnerable places to graffiti vandalism damages.

Table 5.40: Number of graffiti vandalism damages based on width of street

		frequency	Percent	Valid percent
1	Very Narrow	1	0.6	0.6
2	Narrow	28	17.5	17.5
3	Average	**95**	**59.4**	**59.4**
4	Wide	36	22.5	22.5
5	Very Wide	0	0	0
	Total	160	100.0	100.0

Q.17 The maintenance level of the property

This question is designed based on broken windows theory to find out if maintenance level of the property correlated with degree of graffiti vandalism damages. Table 5.41 shows the number of graffiti vandalism damages based on the maintenance level of the properties. The finding supports SCP theory and shows vandals targeted low maintained buildings more than well maintained buildings.

Table 5.41: Number of graffiti vandalism damages based on maintenance level of properties

		frequency	Percent	Valid percent
1	Very Low	13	8.1	8.1
2	Low	**69**	**43.1**	**43.1**
3	Average	60	37.5	37.5
4	High	18	11.2	11.2
5	Very High	0	0	0
	Total	160	100.0	100.0

Q.18 Presence of vandalism on property

This question is designed based on rapid repair theory suggested the evidences of vandalism on a property lead to more occurrence of vandalism. It examines if there is any relationship between presence of vandalism on properties and degree of graffiti damages. Table 5.42 shows the number of graffiti vandalism damages based on the evidences of vandalism damages on targeted properties.

Table 5.42 : Number of graffiti vandalism damages based on presence of vandalism on targeted properties

Presence of vandalism		Frequency	Percent	Valid percent
1	1	53	33.1	33.1
2	2	**62**	**38.8**	**38.8**
3	3	33	20.6	20.6
4	4	8	5.0	5.0
5	5	4	2.5	2.5
	Total	160	100.0	100.0

Q.19 The quality of the building (construction)
Q.20 The quality of the building (design and the harmony with the environment)

These two questions are design to assess how physical design of the environment suggested by SCP theory correlated with degree of graffiti vandalism damages.

Table 5.43 and 5.44 presents information about the quality of the building in terms of construction, architecture design and harmony with the environment. The criteria to assess the design quality of the property in terms of construction and the harmony with the environment are presented in chapter five of this research.

Table 5.43: Number of graffiti vandalism damages on the basis of quality of the building (construction)

		frequency	Percent	Valid percent
1	Very Low	2	1.2	1.2
2	Low	53	33.1	33.1
3	Average	**83**	**51.9**	**51.9**
4	High	22	13.8	13.8
5	Very High	0	0	0
	Total	160	100.0	100.0

Table 5.44: Number of graffiti vandalism damages on the basis of architecture design and harmony with the environment

Light level		frequency	Percent	Valid percent
1	Very Low	4	2.5	2.5
2	Low	76	47.5	47.5
3	Average	**63**	**39.4**	**39.4**
4	High	17	10.6	10.6
5	Very High	0	0	0
	Total	160	100.0	100.0

The results from assessment show that the properties with average level of quality in terms of construction, architecture design and harmony with the environment were the main target of graffiti writers.

The second part is the assessment of the data obtained from 160 vandalised properties assessed in three selected urban areas of Tehran to investigate any correlation between related SCP variables and degree of non political graffiti damages.

In order to measure the strength and direction of a link between the sets of data, Spearman's Rank Correlation Test has been suggested to investigate any correlation between the SCP variables and degree of non political graffiti damages.

According to the result from Spearman rank correlation test, Table 5.45 is to measure the degree of association between the degree of damages and the studied SCP variables based on the assessment of 160 samples in three selected urban areas of Tehran.

Table 5.45: Degree of association between the degree of damages and studied SCP variables

No.	Situational Prevention variables	P	Confidence of correlation
Q6	Level of lighting in place	0.418	0.064
Q7	Glossiness of the vandalised surface	**0.023***	**-.180**
Q8	Lightness of the colour of the vandalized facade	0.131	-0.12
Q9	Size of vandalised facade	**0.017***	**.189**
Q10	Informal surveillance: Level of the risk of being seen by people in the place (day time)	0.156	0.113
Q11	Informal surveillance: Level of the risk of being seen by people in the place (night time)	0.776	0.023
Q12	Informal surveillance: Level of traffic of cars (day time)	0.465	0.058
Q13	Informal surveillance: Level of traffic of cars (night time)	0.691	-0.032
Q14	Level of visibility of the vandalised property to people	0.834	0.017
Q15	Level of Formal surveillance: Police patrol/ Security Guard	0.34	0.076
Q16	The width of the street	0.213	-0.099
Q17	The maintenance level of the property	**0****	**-.415**
Q18	Presence of vandalism	**0****	**.483**
Q19	The quality of the building (construction)	**0****	**-.283**
Q20	The quality of the building (design and the harmony with the environment)	**0.009****	**-.207**

*p<0.05, **p<0.01 $-1<\rho<+1$

The result from table 5.46 revealed a clear relationship between degree of non political graffiti damages and six SCP Variables as follows:

Q.7 Glossiness of the vandalised surface
Q.9 Size of vandalised facade
Q.17 The maintenance level of the property
Q.18 The evidences of vandalism on vandalised property
Q.19 The quality of the building (construction)
Q.20 The quality of the building (design and the harmony with the environment)

According to table 5.45, presence of vandalism on properties was known as the most important factor lead to high degree of graffiti vandalism damages. It indicates to the important role of "rapid repair" to prevent high degree graffiti vandalism damages in urban areas of Tehran.

The maintenance level of the vandalised property was known as the second variable correlated strongly with high degree of graffiti damages. Properties with low level of maintenance are more in danger of high degree graffiti vandalism damages.

Of all six variables correlated with high degree of non political graffiti damages, glossiness of the vandalised surfaces has the minimum effect on degree of graffiti vandalism damages. The relationship between the glossiness of the surfaces and scale of graffiti vandalism damages is in opposite direction. Graffiti writers are less likely to vandalise glossy surfaces in urban areas of Tehran.

The quality of the building in terms of construction and the quality of the building in terms of design and the harmony with its environment were known as the third and fourth Variable correlated with high degree of non political graffiti damages. It shows enhancing the quality of the construction as well as design quality and harmony of the property with its surrounding urban environments is expected to decrease the degree of graffiti vandalism damages.

Size of vandalised facade was also identified to be correlated with high degree of graffiti damages. The high degree of graffiti damages are more likely to happen on broad surfaces.

The variables identified to be correlated with high degree of non political graffiti damages are priories as follows:

Q.18 The evidences of vandalism on vandalised property
Q.17 The maintenance level of the property
Q.19 The quality of the building (construction)
Q.20 The quality of the building (design and the harmony with the environment)
Q.9 Size of vandalised facade
Q.7 Glossiness of the vandalised surface

5.2.3 Vandalism and Graffiti: Causes and Consequences

The aim of this part is to investigate the perception of juveniles' regarding the various aspects of vandalism along with its main causes and risk factors in the urban areas of Tehran.

Vandalism and perception of safety: Although the effects of vandalism on perception of safety has been proven by environmental prevention theories in different studies (Goldstein 1996) but the assessment of the correlation between vandalism and graffiti to different types of targets in particular and perception of safety in Tehran urban areas is a neglected research topic.

Respondents were asked to rate how vandalism to any common types of targets is concern to them. It will help to put more efforts to prevent such types of vandalism damages that might be a growing concern to respondents.

There are four types of vandalism on the basis of the targets occurring in Tehran as follows:

1. *Damages to residential and non residential buildings in the neighbourhood*
2. *Damages to vehicles (cars, motor cycles, bicycles) in the neighbourhood*
3. *Damages to public properties in the neighbourhood*
4. *Damages to landscapes and green areas in the neighbourhood*

The data presented in Table 5.46 shows the Friedman rank test result. As the $\rho<0.05$ (Table 5.47), the Friedman test is positive and shows the variables are significantly different from which other variables.

Table 5.46: Friedman rank Test (Types of vandalism/ respondents' Concern)

Factor	Mean rank
1	2.15
2	**2.71**
3	2.68
4	2.46

Table 5.47 :Test Statistics (Friedman Test) (Types of vandalism/ respondents' Concern)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
494	81.195	3	**0.000**

significant at $\rho <0.05$

Table 5.46 shows that teenager students are more concerned about different types of damages to the cars while it seems that any vandalism damages to residential and non residential buildings are not a concern to respondents.

It also has been examined if there is any correlation between four types of vandalism damages and perception of safety from the view of respondents.

Table 5.48 presents the degree of association between the types of vandalism and perception of safety from the view of respondents.

Table 5.48 shows a clear relationship between 3 types of vandalism damages and perception of safety in urban areas of Tehran from the view of respondents. The relationship between 3 types of vandalism damages and perception of safety in Tehran is in opposite direction. It means that increasing the rate of such types of vandalism in

neighbourhoods, has negative effects on respondents' perception of safety. However, damages to residential and non residential buildings are not correlated with perception of safety.

Table 5.48: Degree of association between the types of vandalism and perception of safety

No.	Types of vandalism	P	Confidence of correlation
1	Damages to residential and non residential buildings in the neighbourhood such as writing (graffiti) on the walls, breaking the windows, destruction of façade and surface of walls through the application of explosive materials	0.149	-0.065
2	Damages to vehicles (cars, motor cycles, bicycles) in the neighbourhood such as scratching paintwork, indenting the cars, damaging wing mirrors and smashing windows	**0****	**-0.195**
3	Damages to public properties in the neighbourhood such as spilling garbage and other wastes in public places, breaking street furniture, causing fire and incineration of street furniture	**0.002****	**-0.137**
4	Damages to landscapes and green areas in the neighbourhood such as writing (graffiti) on trees, peeling , scratching and uprooting the trees	**0.001****	**-0.147**

* $\rho < 0.05$, ** $\rho < 0.01$ $-1<\rho<+1$

To find out the effects of graffiti vandalism occurrences on respondents' perception of safety, selected pictures (taken from Tehran neighbourhoods) were shown to respondents and they were asked to answer the questions about their concern of safety in the area shown in figure 5.4.

Figure 5.4: The vandalised properties from Tehran neighbourhoods

Table 5.49 How do you concern your safety in the area shown in figure 5.4

Peoples' perception of Safety	Frequency	Percent	Valid Percent
Very Scary	120	23.9	24.7
Scary	106	21.1	21.9
Average	128	25.4	26.4
Safe	74	14.7	15.3
Very Safe	57	11.3	11.8
Total	458	96.4	100.00
Missing System	18	3.6	
Total	503	100.00	

Respondents were more likely to rate the area as very scary (23.9%), scary (21.1%) and average (25.4%). Moreover, it has been concluded that 70% of respondents with the lowest perception of safety in the area shown in Figure 5.4, rated vandalism as a very serious crime , serious crime or relatively serious crime in the city. It may indicate indirectly to the effects of graffiti vandalism damages on perception of safety in urban environment (Table 5.50).

Table 5.50 : respondents' concern of safety

		Response rate (%)
1	Not a crime	20.09
2	Not a serious crime	10.27
3	Relatively serious crime	15.18
4	Serious crime	25.00
5	very serious crime	29.46

Vandalism and causes: The literature review revealed that there are conflicting and contrasting views on the causes of vandalism known by criminologists and psychologists that can vary from community to community and depends on social and environmental characteristic of the society. To find out the causes of vandalism among teenager students in Tehran, six causes of vandalism were defined and respondents were asked to determine on the most common causes of vandalism.

Table 5.51: Friedman rank Test (Causes of Vandalism)

	Factor	Mean rank
1	Anger	3.31
2	Family problems	3.51
3	Boredom	3.59
4	Show off to friends	**3.78**
5	Revenge	**3.78**
6	The enjoyment of taking risk	3.03

Table 5.52:Test Statistics (Friedman Test) (Causes of Vandalism)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
466	71.817	5	**0.000**

significant at $\rho < 0.05$

Data presented in table 5.51 shows that the result from Friedman rank Test that is statically significant as $\rho<0.05$

Revenge and Show off to friends are known by majority of respondents as the most likely causes of vandalism and graffiti in urban areas of Tehran.

The test has been conducted for both groups of male and female students to explore if there is any correlation between sex and likely causes of vandalism. The data from Friedman rank Test is presented in table 5.53 and table 5.55.

Table 5.53: Friedman rank Test (Causes of Vandalism/Male students)

Factor	Mean rank
1	3.39
2	3.48
3	3.55
4	**3.93**
5	3.65
6	3.00

Table 5.54 :Test Statistics (Friedman Test) (Causes of Vandalism/Male students)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
323	55.360	5	**0.000**

significant at $\rho < 0.05$

Table 5.55: Friedman rank Test (Causes of Vandalism/Female students)

Factor	Mean rank
1	3.17
2	3.59
3	3.68
4	3.44
5	**4.04**
6	3.08

Table 5.56:Test Statistics (Friedman Test) (Causes of Vandalism/Female students)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
140	32.784	5	**0.000**

significant at $\rho < 0.05$

Result shows that show off to friends is recognised by male students as the most likely causes of vandalism whereas female students define revenge as the most likely causes of vandalism. It should be noted that enjoyment of taking risk is known as the least likely causes of vandalism by both groups.

Vandalism prevention initiatives: There are different measures to tackle vandalism suggested by criminologists and psychologist. Respondents were surveyed on the most effective measures implemented in Tehran to tackle vandalism. Eight variables are defined and presented in table 5.57.

Table 5.57: Friedman rank Test (Vandalism Prevention)

Factor		Mean rank
1	Presence of the police	**5.63**
2	Presence of people	4.13
3	Darkness of the area	3.76
4	Brightness of the area	4.09
5	Punishment	**4.87**
6	CCTV	**4.90**
7	Anti vandalism programs in the society	4.30
8	Anti vandalism programs at schools	4.33

Table 5.58 :Test Statistics (Friedman Test) (Vandalism Prevention)

N of Valid Cases	Chi-Square	Df	Asymp. Sig.
442	220.363	7	**0.000**

significant at $p<0.05$

Table 5.58 shows that the exact ρ value is less than the specified α level (0.00<0.05) and the Friedman test is positive.

Result from table 5.57 indicates that presence of the police, CCTV and punishment were rated as the most effective measures to tackle vandalism by potential offenders. It also shows darkening the area was the least effective measure to tackle vandalism. It is consistent with the findings from first part of this chapter showing that dark places were more vulnerable to vandalism. Figure 5.5 shows that 30.1% of respondents rated vandalism as a serious crime. This group has been asked to decide upon the most important factor to deter vandals of committing vandalism in Tehran.

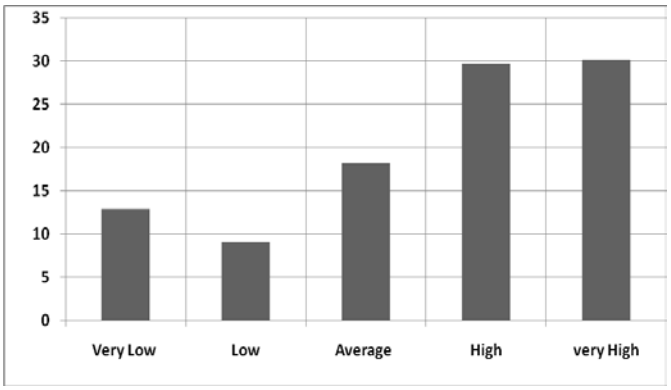

Figure 5.5: how vandalism is rated as a crime by respondents

The most deterrent factors to vandals were defined in question 8 as:

1. *Call the police*
2. *Warning the vandal/vandals of their act*
3. *If he/she is seen by any residents or pedestrians in the streets*

Table 5.60 shows that the exact ρ value is less than the specified α level (0.00<0.05) and the Friedman test is positive.

It can be concluded that call to the police is known as the most deterrent factor to vandals by respondents, whereas warning the vandals of their act is not so effective to deter vandals of committing vandalism (Table 5.59).

The findings from both questions indicated to the importance of providing formal surveillance to prevent vandalism in urban areas of Tehran.

Table 6.59: Friedman rank Test (Vandalism/ Deterrent Factors)

Factor	Mean rank
1	**2.43**
2	1.63
3	1.94

Table 5.60:Test Statistics (Friedman Test) (Vandalism/ Deterrent Factors)

N of Valid Cases	Chi-Square	df	Asymp. Sig.
290	115.969	2	**0.000**

significant at $\rho < 0.05$

5.3 Summary

This chapter describes the various descriptive and inferential statistical analyses used to explain the data. The findings summarised in the form of charts and tables to assist with comparative analyses for the performance evaluations.

Next chapter describes all research findings and conclusions drawn from the study and gives the recommendations for future studies.