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Determination of Important Building Construction Adverse Impacts Creating Nuisances in Residential Areas on Neighbouring Community

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ABSTRACT

The construction industry is criticized due to poor stakeholder management. Whereas, the stakeholders play important roles in the completion of construction projects in line with their concerns and needs. Therefore, it is crucial to identify and incorporate the needs and concerns of the stakeholders during management applications for the commercial success of a construction project. For that purpose, in this study, the adverse impacts of the building constructions in residential areas which create nuisances on one of the external stakeholders, namely neighbouring community, are aimed to be identified. Thus, a questionnaire survey is performed with 266 respondents neighbouring building constructions in different cities of Northern Cyprus. A model based on the adverse impacts of building constructions and their categories is proposed, and this model is analysed using structural equation modelling (SEM). The results of the participants reveal that the entire adverse impacts are perceived as contributing causes for a disturbance on the neighbouring community. Last but not least, conducted research highlights that the social and cultural manners of the society which shows variations from region to region plays a significant role in the way community absorbs and experiences these adverse impacts.

Keywords: Construction projects, neighbouring community, nuisances, stakeholder management, structural equation modelling.

1. INTRODUCTION

Many different contributing parties have power and ability to influence or change a managerial decision of construction projects. Therefore, performance of these parties during a project life cycle is a determining factor for the success of a construction project. For instance, the

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neighbouring community of construction projects is one of the important contributing parties for the success of construction projects as they are highly involved with the unavoidable nuisances generated from the execution of construction activities which create immense alterations in their daily routine. Consequently, comprehending the existence of neighbouring communities and in a format, incorporating their opinions during the decision-making process is a critical issue in the success of the construction projects [1]. This is why researchers of this study suggest consideration of neighbouring communities as stakeholders.

PMI [2] defines a stakeholder as any party which may affect, be affected by, or perceives itself to be affected by the processes conducted throughout the project. PMI [2] also considers stakeholder management as one of the knowledge areas of project management and emphasizes the importance of stakeholder management in project management. Even, some of the researchers [3] concluded that most of the unsuccessful projects are due to inappropriate social interactions between the project stakeholders rather than lack and ineffective project management practices. Unfortunately, the stakeholder management is poorly applied in the construction industry [4], since the stakeholder management is a difficult process due to high complexity, uncertainty, and equivocality of the project environment [5].

All of the parties involved in the construction internally and externally should be pondered to manage stakeholders effectively. However, most of the contractors and owners overlook the external stakeholders, especially neighbouring community. Therefore, the contractors generally prepare their bids by ignoring the costs required for compensating adverse impacts of the construction activities on the community and indirect costs emerged due to the conflicts and controversies [6]. Whereas, in urban areas, members of the community, who are integrally residents and businesses in the neighbourhood of a construction site, are exposed to wide range of construction causative adverse impacts [7], in terms of ecology, sociology and economy [8, 9]. Especially in urban areas, due to high density of population, construction practices can cause serious environmental nuisances for the adjacent residents and businesses, which will eventually transform into economic loss [10, 11]. Due to these economic losses, these parties may demand compensations from the contractors. Besides, the contractors can face conflicts and controversies due to the nuisances caused by the construction. For instance, the community and non-governmental organizations can protest and litigate the contractors. Also, they can exercise pressures on the governmental agencies, which in turn may lead to strict inspections. These can cause an increase in the likelihood of failures, delays, and economic losses.

Due to the importance of stakeholder management, there are many studies concerning the stakeholder management, however, most of these studies generally focus on three themes, namely identifying the nature of stakeholders, examining under which circumstances and how stakeholders influence organizational decisions and operations and identifying different strategies to deal with stakeholders [12]. On the other hand, there is a limited number of studies about how the stakeholders are affected by the construction processes. Whereas, the contractors can manage their stakeholders more effectively by obtaining an indication of the stakeholder groups' concerns, the problems of the project team faces and stakeholders' requirements of the projects [13]. If these various concerns and needs are not analysed thoroughly and managed properly, severe conflicts and controversies can be expected, which may lead to cost and time overruns [14]. In addition, most of the studies related to stakeholder management generally focus on owner, subcontractor, and suppliers, however, neighbouring community is generally overlooked in these researches.

In the literature, there are also some attempts about the adverse impacts of the construction projects creating nuisances, however, all these studies tried to quantify the adverse impacts. For instance, Gilchrist and Allouche [15] proposed a framework to quantify the adverse impacts for infrastructure construction projects in urban areas. Liu, Huo [6] developed a decision model by using an intuitionistic fuzzy group for bid evaluation of urban infrastructure projects including adverse impacts. Matthews, Allouche [16] quantified the disruptions emerged during pipeline infrastructure projects. Although these studies tried to identify the adverse impacts of construction projects, they did not determine which adverse impacts leading to more severe nuisances on the neighbouring community. In other words, they assumed that all these adverse impacts affect the neighbouring community at the same level. Therefore, they calculated the amount of compensation cost by considering all those adverse impacts at the same intensity. This causes to obtain either higher or smaller compensation costs than the actual one incurred by the stakeholders. In addition, since they just considered the quantification of the compensation cost and ignored the effectiveness level of these adverse impacts, the management of these adverse impacts was overlooked. Consequently, in the literature, there is a gap about the identification of the most important adverse impacts which create nuisances on the neighbouring community and development of a systematic roadmap for managing these nuisances.

This paper concentrates on the identification of the most important needs and concerns of the stakeholders, namely neighbouring community. For that purpose, the most severe adverse impacts of building constructions which lead to the nuisances on the neighbouring community in the residential areas are aimed to be identified based on a questionnaire survey conducted in Northern Cyprus, therefore, more effective neighbouring community management systems can be developed by focusing on these important adverse impacts principally and eliminating the unnecessary costs. Therefore, the conflicts and controversies which emerge between the neighbouring community and contractors can be eliminated or mitigated applying this system.

2. DEVELOPMENT OF A THEORETICAL FRAMEWORK

2.1. Determination of Main Categories of Adverse Impacts

In the development of a generic model, firstly a literature survey is conducted to determine the main categories of adverse impacts emerged due to the execution of construction activities. The studies related to the determination of adverse impacts are generally conducted for specific construction types. For instance, one of the first efforts performed by Read and Vickridge [17] focused on public utility projects and identified eleven adverse impact categories. Similarly, Gilchrist and Allouche [15] mentioned about four categories of adverse impacts of infrastructure projects in urban environments. These categories are traffic, economic activities, pollution, and ecological/social/health. Xueqing, Bingsheng [18] developed a bid evaluation method by considering the social impact of infrastructure projects in urban areas. According to them, adverse impacts of these projects can be categorized into four groups, namely natural environment, public property, local economy, and human society. Liu, Huo [6] developed a decision model for urban infrastructure projects and used similar impact categories proposed by Xueqing, Bingsheng [18]. Ormsby [19] developed a framework for estimating the total cost of buried municipal infrastructure renewal projects. In this study, the external impacts of the projects are considered under three categories, namely social, economic and environmental impacts. Yuan, Cui [20] conducted a study for green building projects and classified the adverse impacts in four main categories, namely impact on the community, impact on the economy, impact on the environment and public property. Xue, Zhang [21] focused on urban subway construction and determined four impact factors which can affect the satisfaction of a community negatively based on environmental, social impact, and stakeholder theory. These impact factors are the impact on residents' travel, transportation, environment and daily life. Matthews, Allouche [22] considered eight adverse impacts of pipeline infrastructure projects to assess the social cost of these projects. The adverse impacts in this study were stated as travel delay, vehicle operating costs, decreased road surface value, lost business revenue, loss of parking revenues, cost of dust control, noise pollution costs and safety. Similarly, Nunes Vasconcelos [23] conducted another study for pipeline infrastructure projects and determined four impact areas, namely economy, traffic, damage to environment and health, and pollution. Çelik, Arayici [24] tried to monetize the social costs of housing projects on the built environment and classified the adverse impacts of these projects under three main categories, namely damage to natural and built environment, pollution and traffic problems.

Although most of the studies related to adverse impacts of construction projects considered specific construction types, there are also some studies which proposed that all construction projects cause same adverse impacts. They also asserted that the intenseness of these impacts can vary with the construction type [25]. For instance, Yu and Lo [26] developed quantification of the adverse impacts of construction operation on local areas by considering traffic impacts, environmental impacts, and business impacts. Similarly, Wang, Han [27] investigated the reaction of the public to social impacts of construction projects and considered three types of negative project impacts in their study, namely negative impacts on the environment, income and living standards.

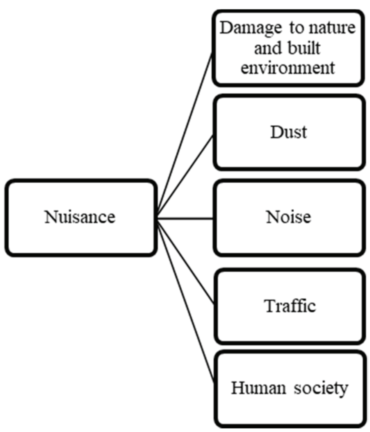

Figure 1 - The proposed model used in this study

In this study, considering the literature, four categories for adverse impacts are identified. These categories are damage to nature and built environment, pollution, traffic, and human society. However, the pollution created by dust and noise is considered separately, since they create different nuisances on the neighbouring community. Besides, in the literature, most of the studies about nuisances are conducted by considering infrastructure projects, therefore the local economy is considered as an important impact category in these studies. However, the aim of this study is identifying the nuisances of the residents who do not perform economic activities, therefore the negative impacts of construction projects on economic activities performed within the facility of the construction site are considered as out of the scope of this study. Consequently, in harmony with the past studies, categories of building construction-borne adverse impacts have been determined as shown in Figure 1.

2.2. Determination of Adverse Impacts

At the second step of the development of a theoretical framework, a literature survey is conducted. Then, 18 adverse impacts of construction projects are determined by considering the studies of [15, 22, 24, 25], these adverse impacts are categorized under five adverse impact categories stated before. The following sections present detailed information about these adverse impacts and their categories.

2.2.1. Damage to Nature and Built Environment

The impacts of the construction projects in urban areas on ecology are considered as limited since the environment has already been damaged by years of urbanization. However, if the project is conducted in or near recreational areas, this effect can be more intense. Especially, when the number of recreational areas in the neighbourhood is limited, then the reaction of the community can be very drastic [15].

2.2.1.1. Loss in Serviceability of Playfield and Parks

Due to the formation of various impacts because of the on-going construction activities in the neighbourhood, access to some of the recreation facilities in the area may be temporarily unavailable or serviceability standards of those facilities may decrease due to the impacts created by the construction project.

2.2.1.2. Loss of Habitats and Parks

In order to prevent fragmentation, lessening and/or loss in the existing parks and habitat in the area/neighbourhood, land management concerning habitat conservation is necessary for the construction projects. However, due to probable deficiencies of the contractor in land management, habitats/parks of the area may be damaged.

2.2.1.3. Loss of Landscape Standards

Another effect of activities of construction projects on the environment which can be considered as an important nuisance is a loss of landscape standards. The construction activities can change the landscape in the neighbourhood by replacing or removing trash barrels, street furniture, street lights, phone boxes, street post boxes, street signboards, street flower pots etc. The society is affected from this landscape transformation, since the natural view is an important criteria and the society is ready to pay more money for a nice natural view [28].

2.2.2. Dust

One of the adverse effects of construction of buildings on the environment is the dust since there are many dusty activities which produce airborne particles and dust in the construction areas. Therefore, throughout the construction activities, high amount of dust can be observed on the construction site, and the dust in the construction area can be carried to the neighbourhood community by the breezes [29]. The dust can cause damage to the electronic and mechanical equipment. In addition, it can lead to health problems due to some chemical materials within the dust. Consequently, the neighbourhood community can suffer from the dust in their houses, cars, living environments and backyards.

2.2.3. Noise

Noise is defined as any sound that has potential to cause psychological or physiological symptoms [15]. Bein [30] stated that noise can affect social behavioural, the mental and physical health of people. Unfortunately, construction is one of the main sources of noise. Noise will be generated by site operations including heavy earthmoving and paving equipment, operator pumps, generators, and vehicle traffic and demolition activities. The effects of noise are not limited only with psychological and physiological symptoms, but also the economic effects of noise to the neighbouring community are also observed. For instance, the value of real estates in noisy environments tends to be lower than in quieter environments. Based on this discussion, three adverse impacts of noise are proposed in this study, namely loss of peace and quietude of the neighbourhood, degradation of ambient conditions and prevention of usage of the outdoor areas of the house.

2.2.4. Traffic

The negative effects of construction projects on the traffic were stated widely in the literature [31, 32] as given below.

2.2.4.1. Prolonged Closure of Road Space

Although most of the construction activities are performed within the border of the construction site, some of the activities of the construction can require space outside the construction site, such as movement of machineries while performing the construction activities and entry/exit corridors. Especially, in urban areas, the entry/exist corridors can affect the traffic flow intensely since the manoeuvre capacity of the construction vehicles is so limited when compared with the vehicles used in daily life. These could lead to time delay costs, extra oil combustion, an increase in the number of traffic accidents, vehicle loss cost and environmental pollutions [33].

2.2.4.2. Detours

Due to the construction activities such as utilization of mobilized crane and entry of trucks to the construction site, the roads can be closed for a while, therefore the vehicles can be diverted to the secondary roads designed for light traffic loads in order to avoid excessive delays. This can create problems related to deterioration of road pavement due to overloading which decrease the economic life of the pavement structure, therefore the travel comfort of the drivers will be affected. In addition, the detours can cause nuisances to the drivers in terms of increased fuel consumption and time.

2.2.4.3. Loss of Parking Space

The loss of parking space is another nuisance for the travellers since they have to park farther away and spend more time walking which can be used for more productive purposes [16]. As a result of this, there can be a time delay, extra oil combustion, an increase in the number of traffic accidents, vehicle loss cost, and environmental pollutions [33].

2.2.4.4. Utility Cuts

The utility cuts are considered as one of the adverse impacts of construction projects on traffic by Gilchrist and Allouche [15]. The construction activities can involve the cutting and restoration of paved structures, in addition, the loading trucks can cause damage to the pavement surfaces due to the settlement [15].

2.2.5. Human Society

Although there are tremendous positive impacts of the construction industry on the society, it also affects the life of the human society negatively; in addition, some of these effects are irreversible.

2.2.5.1. Road Safety

The probability of enhanced accident risks due to construction machinery circulating in the neighbourhood/area, spillage of construction materials on the roads during transportation of materials into/out of the construction site, other construction wastes/residuals and etc. may cause traffic congestion, closure of the road, and detours due to probably lessened road safety standards. On the other hand, excess traffic on minor residential area roads may reduce the safety standards of the roads.

2.2.5.2. Human Health Hazards

The adverse impacts created throughout the construction can lead to serious health problems to the environment. For instance, the high concentration of dust in the air can lead to declination in lung function, increase in respiratory hospitalization and increase in mortality from respiratory and cardiovascular causes [34]. As stated before, the noise also can cause health problems such as high blood pressure, cardiovascular disease, anxiety, restlessness, irritability, sleep disturbances and difficulty in concentrating [15, 35].

2.2.5.3. Living Quality Decline

With the newly adverse impacts, the neighbouring communities confront with the decline in their quality living standards. For instance, time spending outside can decrease drastically due to the pollution.

2.2.5.4. Safety Hazards in the Area

The construction sites are dangerous places for the workers, and this is also valid for the neighbouring community, especially when the area of the construction site is limited and it is close to the public areas. Some of the risks occurring due to construction in the area such as; the probability of enhanced accident risks caused by construction machineries being in neighbourhood traffic, spill of construction related material on the roads during transportation of materials into/out of the construction site, additional hazards that are possibly to occur during the actual construction which may result in injuries of the residents, construction wastes/residuals forming threats on the residents' health, possible crime incidents of construction workers, etc., traffic jam in the area and etc.

3. RESEARCH METHODOLOGY

This study is about the identification of adverse impacts emerged due to the execution of construction activities in residential areas. For that purpose, a questionnaire which consists of two parts is designed and applied to 266 respondents in the three largest cities of Northern Cyprus, namely Famagusta, Kyrenia, and Nicosia. The target population is selected from the people who reside within a 150 m radius of the construction site so that all of the respondents are selected from the people exposed to the adverse impacts at the same degree. The first part is designed to illustrate the demographic structure of the respondents. In this part, the gender, age group and level of education are asked to verify whether there is a heterogeneity among the respondents or not. A community normally has a heterogeneous structure in terms of lifestyle. Individuals of the community have different views and perspectives in giving reaction to any alterations in their daily routine, therefore, more heterogeneity in the sample leads to capturing the different perspectives from different groups. Table 1 shows the demographic structure of the respondents, according to this table, all age groups are included in this research equally; besides, the opinions of people who have different education level are also obtained. Consequently, it can be said that the heterogeneity of the respondents is satisfied and the perception of the respondents who have different demographical background can be captured.

Table 1 - Demographic structure of the respondents

Gender	
Male	52.26%
Female	47.74%
Age Groups	
18-24	22.56%
25-33	24.06%
34-44	21.43%
45-54	15.04%
55-65	12.41%
66 and over	4.51%
Level of Education	
Literate	0.38%
Primary school	16.17%
Secondary school	7.89%
High school	34.59%
2-year college degree	0.38%
4-year college degree	25.94%
Master's degree	3.01%
Doctoral degree	11.65%

The second part is about measuring how intense participants experience the adverse impacts of building construction projects. For this section, 18 pre-identified adverse impacts which are illustrated in Figure 2 are examined through measuring the experience level of participants. In this part, the respondents evaluated the way they experience adverse impacts based on 10 points Likert scale, according to this scale; 1, 5 and 10 indicate “none”, “moderate” and “very high”, respectively. In other words, if the respondent considers that the on-going building construction affects its life in terms of any criterion intensively, they will assign this criterion with a high value. On the other hand, if this effect is limited, then the respondent can prefer different values than 10 based on the severity of this effect.

4. ANALYSIS

One of the important steps of the analysis is the selection of the analysis method by considering some or all of the criteria such as; accuracy, sensitivity, selectivity, robustness, time and availability of equipment. In this study, the analysis method is selected by comparing the features of the analysis methods. Although traditional statistical analysis methods can provide valuable information about the severity of these adverse impacts, they may not reflect the real situation since they do not consider the interrelationships between the adverse impacts. Whereas, there are interrelationships between the adverse impacts. In other words, the emergence of one of the adverse impacts can lead to the creation of another adverse impact, or the existence of two adverse impacts at the same time can increase the perceived nuisance level. For instance, cleanliness of the house is one of the important adverse impacts of dust, however, it can also lead to problems in human health, which in turn, may lead to human health hazards, and therefore cleanliness of the house can have a more disturbing effect on the neighbouring community than assigned by the respondents. Therefore, to reveal the real nuisance levels of these adverse impacts on the neighbouring community, a more complex analysis method which can estimate the model which consists of interrelationships between the adverse impacts should be selected. Therefore, a different method, namely structural equation modelling (SEM) which is capable of dealing with the numerous numbers of dependent variables and examining direct and indirect relationships between one or more independent variables and one or more dependent variables, is decided to be used. The SEM analysis is performed by using EQS 6.4, a software program used for performing SEM analyses. Based on the developed theoretical framework, a model consisting of 18 indicators, 5 latent exogenous variables, and 1 latent endogenous variable is used in the analyses. Indicators are the variables whose effects can be measured. Indicators can be considered as independent variables in SEM. Latent variables cannot be measured directly, therefore they should be estimated by measuring the effects of indicators representing latent variables’ effect. Latent variables can be considered as dependent variables in SEM. There are two types of latent variables. These are latent exogenous variables, which are determined based on indicators and affect other variables in the model, and latent endogenous variables which are influenced by the exogenous latent variables in the model, directly or indirectly.

Before application of the SEM, some of the factors should be considered to check the appropriateness of the dataset for SEM analysis. Firstly, the internal reliability of the data set is examined by performing reliability analysis with the alpha model via SPSS 22. Since, in this survey, different social groups who have different social backgrounds are considered in the research, the reliability of the data should be examined prudently. According to the reliability analysis, the Cronbach alpha is calculated as 0.903 which is higher than the threshold value (0.7) recommended by Nunnally [36] for internal reliability. In addition, the reliability coefficient rho, the square of the multiple correlation coefficient is determined as 0.910. Consequently, the dataset obtained for this research is concluded as internally stable.

The sample size is another important factor which should be considered. In SEM, the larger sample size is required to estimate the weights and fit indices accurately. There are different recommendations about the required sample size for SEM applications, for instance, Ding, Velicer [37] determined that the minimum satisfactory sample size should be between 100 to 150 subjects. On the other hand, some authors recommended a minimum ratio of parameters to the sample size instead of a minimum sample size. Rule of 10 requiring the choosing of 10 observations per indicator in setting a lower bound for the adequacy of sample sizes is widely accepted and used in the literature [38]. In this research, the number of observations is 266; therefore, the dataset is adequate for conducting a SEM analysis, since a total number of indicators is 18.

In the next step, the model shown in Figure 2 should be estimated. Firstly, the estimator method should be selected. Maximum Likelihood (ML) method is the default and widely used method in the literature due to its advantages [39]. However, this method provides an accurate fit indices when the normality exists in the data set [39]. Whereas, it can yield distorted outcomes about model adequacy when the multivariate normality assumption violates. Consequently, in order to decide which method is used in the analysis, the multivariate normality of the data set is examined by checking Mardia's coefficient. In this study, this coefficient is calculated as 73.925. This value is far beyond the accepted range of -3 to 3 to declare that the dataset is multivariate normal. Thus, the robust method with ML recommended for the non-normal data set [39] is used for analyses to obtain robust statistics.

The obtained model should be evaluated in two aspects, namely the overall fit of the model and the significance of particular parameters of the model for verifying the reliability of the proposed model [40]. There are different fit indices developed for evaluating the overall fit of the model, however, there is no golden rule for best fit index. On the other hand, reporting a variety of indices is necessary for reflecting different aspects of model fit [41]. One of the indices is essential to state is the model Chi-square along its degree of freedom and associated p-value [42]. In this study, Satorra - Bentler chi-square is calculated as 7.739 based on 4 degrees of freedom. This information is used to test the significance of the difference between the estimated population covariance matrix and the sample covariance matrix [40]. The probability value for chi-square statistics is 0.102 which is higher than 0.05. This indicates that the model fits the data. Although some of the researchers, such as McIntosh [43], Hayduk, Cummings [42], asserted that Chi-square is enough for evaluating the overall fit of the model, the other fit indices are considered in the model evaluation, since the small differences create significant chi-squares when the sample size is large [40]. Hu and Bentler [44] suggested a two-index presentation format. In their study, they recommended the use of both standardized root mean square residual (SRMR) and one of the following indices, Comparative fit index (CFI), Non-Normed Fit Index (NNFI) or Root Mean-Square Error of Approximation (RMSEA). However, SRMR is not calculated for the robust method, therefore SRMR is not available. On the other, Ullman and Bentler [40] used CFI and RMSEA to evaluate the overall fit of their model analyzed by using the robust method. Table 2 shows the fit indices calculated by using the robust method. According to this table, calculated CFI and RMSEA values are placed in the boundary of threshold values, therefore we can conclude that the model fits.

Table 2 - Fit indices of the model

Fit indices	Recommended value	Calculated indices
Bentler-Bonett NNFI	>0.90	0.920
CFI	>0.90	0.935
Bollen's fit index	>0.90	0.936
RMSEA	<0.10	0.067
Lower Limit		0.056
Upper Limit		0.077
X^2/degree of freedom	Bet. 1 and 3	2.182

Secondly, the statistically significant relationships within the model are examined. EQS provides output for evaluating the regression coefficients. Based on this output, all relationships exist between latent exogenous variables and their indicators, and latent exogenous variables and endogenous latent variable shown in the model are identified significant at the 5% level. In addition, a confirmatory factor analysis (CFA) is performed by eliminating the endogenous latent variable for checking the existence of convergent validity based on recommendations of Zainudin [45]. Then, convergent validity can be examined by checking the significance of all factor loadings [46]. All factor loadings obtained at the end of CFA is determined as significant. In addition, to assess the convergent validity, the overall fit of the measurement model, and the magnitude, direction, and statistical significance of the estimated parameters between latent variables and their indicators are examined [47, 48]. Based on these examinations, it is concluded that the convergent validity is verified for this model. Consequently, according to significance levels of the relationships and fit indices, the model used in this research is identified as reliable.

The detailed information about the analysis of the model is shown in Figure 2. The numbers on the light arrows in Figure 2 represent the factor loadings. As stated before, all these factor loadings are determined as significant, therefore all these adverse impacts lead to the formation of nuisances.

Since the path coefficients obtained at the end of the SEM analysis can be used as regression weights, these coefficients are used in determining the effect level of exogenous latent variables on the endogenous latent variable. According to the model, it is observed that all adverse impact categories are very important to create nuisance to the neighbouring community, since "damage to nature and built environment", "human society", "noise", "dust" and "traffic" have significant direct effects on nuisances with path coefficients of 0.998, 0.938, 0.915, 0.987 and 0.925, respectively.

5. DISCUSSION OF FINDINGS

According to the findings of SEM, all of the adverse impact categories are perceived as disturbing by the neighbouring community, and all lead to the creation of the nuisance. Therefore, the contractors should consider all of these categories in stakeholder management and manage them to eliminate the possibility of the emergence of conflicts and disputes.

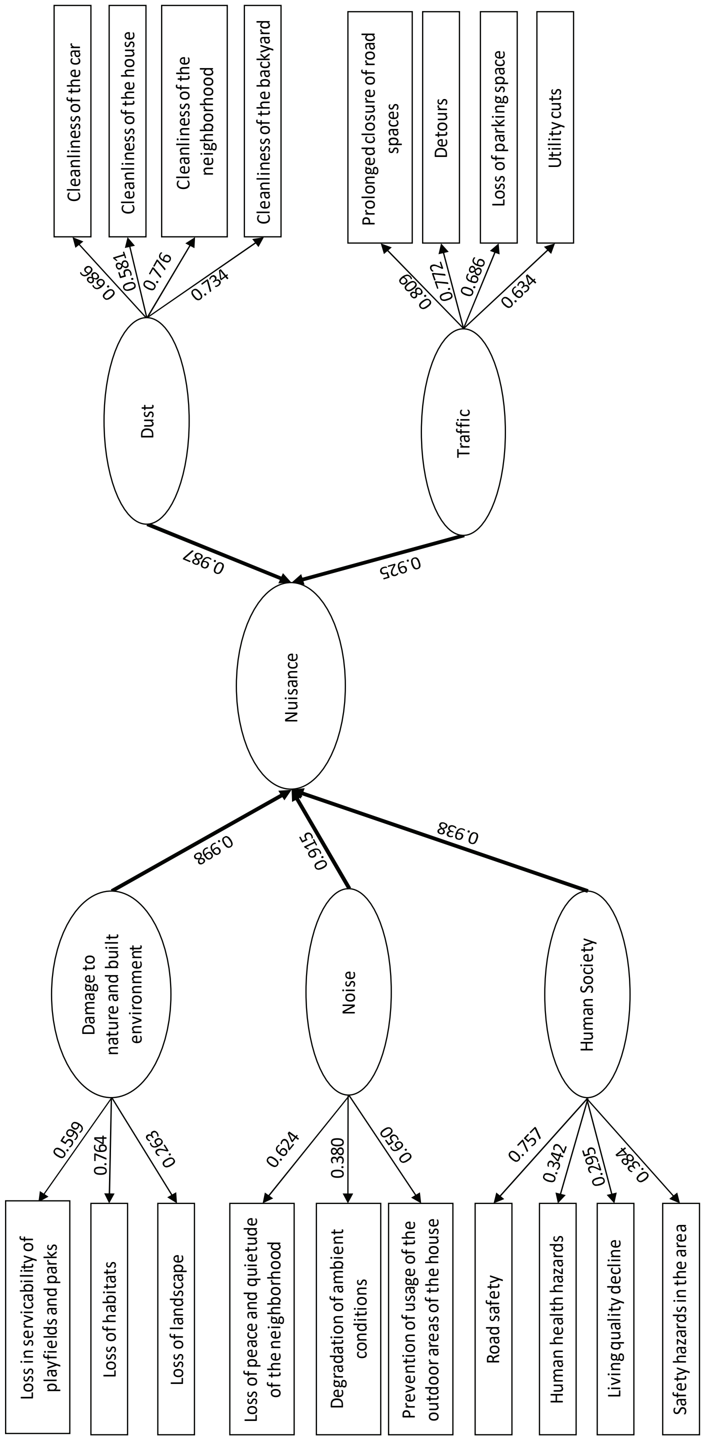

Figure 2 - The proposed model with factor loadings and path coefficients

Although all of the adverse impact categories create nuisances to the neighbouring community intensively, there are two adverse impact categories, namely damage to nature and built environment and dust, which influence the neighbouring community more intensively compared to other nuisances. This shows that the neighbouring community should give importance to nature and built environment, and they should keep in their mind that they will be affected negatively when nature and built environment is impaired due to their construction projects. Shen and Tam [49] acknowledged that the construction industry is known as one of the major contributors to the environment pollution, and with the increasing awareness of the community about nature and built environment, the construction companies can confront with the reactions from the public. Therefore, the environmental management systems can play an important role in the construction companies to manage the neighbouring community. The construction companies can apply ISO 14000 used for standardization of the environmental management system to overcome the problems emerged due to the damage to nature and built environment. In addition, when there will be a damage to nature and built environment, the neighbouring community should be informed about this damage and the agreement between the parties should be reached about methods used for dealing this effect. Hereby, open and trustworthy communication with the media and affected stakeholder, especially on the environmental subjects, is important in the successful implementation of stakeholder management [13, 50]. In addition, this finding shows that the community values the buildings which do not cause damage to nature and built environment, in other words, the sustainability of the constructed buildings is very important for the public. Falkenbach, Lindholm [51] also identified that the contractors can benefit from investing in environmentally sustainable buildings in environmental, social and economic perspective. The significant increase in the number of green buildings constructed annually can be considered as another evidence of this conclusion. Consequently, construction companies can avoid public reactions by developing projects more environment-friendly. Among the adverse impacts of damage to nature and built environment, "loss in serviceability of playfields and parks" is identified as the most significant. On the other hand, "loss of landscape" is determined as the least significant. This shows that people demand more places where they can spend time instead of picturesque sceneries. In other words, demolition of unnatural places is not considered as important as demolition of natural places.

The construction projects produce a high number of airborne particles and dust; therefore, effects of dust are expected to be very disturbing to the neighbouring community. Therefore, dust is identified as one of the most disturbing adverse impact categories in Northern Cyprus. The reason for this finding can be explained by the conditions of Cyprus. Due to the weather conditions of Northern Cyprus, especially high temperature and windy weather, the effects of dust can be more disturbing. Therefore, it can be concluded that dust can be very disturbing in countries where hot and windy weather conditions prevail. Consequently, when considering weights of adverse impact categories, the conditions of the region where the construction projects are conducted should be considered carefully.

When the adverse impacts of the noise are considered, the "prevention of usage of the outdoor areas" is observed as the most significant. Due to the weather conditions and cultural heritage of Northern Cyprus, spending time outside is one of the important rituals of Cypriot people and visiting neighbours is an important tradition, therefore anything which prevents them spending time outside is considered as disturbing. Consequently, the contractors should be aware that due to different cultural background, different adverse impacts can create different level nuisances in different countries. Therefore, they should develop different strategies for stakeholders from different countries. This also verifies the importance of the conditions of the region in the determination of the important adverse impacts.

In addition, the contractors should conceive the culture parameter when managing the stakeholders. Rowlinson and Cheung [52] also emphasize the importance of culture in stakeholder management and propose that different management approaches are required in different locations.

When the human society is discussed, most of the adverse impacts stated under this category, namely "human health hazards", "living quality decline" and "safety hazards in the area", are perceived as less disturbing compared to other adverse impacts. These adverse impacts are not observed immediately, in other words, these effects occur in the long period time, even some of these effects, such as human health hazards, can emerge many years later after completion of the project. In addition, all neighbouring community is not affected by these adverse impacts at the same degree. This shows that the construction companies should focus on the management of adverse impacts which affect the community immediately and widely to reduce complains of the neighbours.

The results of SEM suggest that "prolonged closure of road spaces" and "detours" are the most significant adverse impacts under "traffic" category. This shows that the neighbouring community is affected intensively by the nuisances which cause them time loss and affect their daily routine negatively.

6. CONCLUSION

The building construction projects lead to many adverse impacts on the neighbouring community who is one of the external stakeholders. However, these adverse impacts are generally overlooked, in which turn may lead to conflicts and controversies. Therefore, the construction projects can confront with many problems, such as delays and cost overruns. This shows that development of a management system for neighbouring community is crucial. The first step of development of this system is the determination of the most important adverse impacts creating the nuisances on the neighbouring community. Consequently, in this study, a theoretical framework is developed based on adverse impacts of building construction and their categories.

The theoretical framework consists of five adverse impact categories, namely "damage to nature and built environment", "dust", "noise", "traffic" and "human society", and a total of 18 adverse impacts placed under these adverse impact categories. It is hypothesized that these five categories lead to nuisance. This framework is evaluated by using SEM analysis with a total of 266 questionnaires obtained from Northern Cyprus. This analysis verifies that these five categories have significant role in creation of nuisance.

Among these five categories, "damage to nature and built environment" is perceived as the most disturbing adverse impact category by the neighbouring community. Therefore, the construction companies should be aware of the public's concerns about the nature.

The other interesting finding of this study is the role of cultural heritage and conditions of the region in establishing of nuisances. The construction companies should establish different strategies in management of neighbouring community, since their concerns and demands can vary high among the different regions.

This study has some limitations as other studies. Firstly, although the model developed in this study can be used in different countries, the findings of this study should be considered as country specific. In order to identify the effects of adverse impacts in different countries, a comparative study should be conducted. Furthermore, the parameters identified in this study can be used as a benchmark to conduct similar studies in other project-based industries.

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