Evaluation of Escalator Foot over Bridges Located in a Metropolitan Area

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APPROVAL

The Thesis and Project titled **"**Performance Evaluation of Escalator Foot over Bridges Located in a Metropolitan Area" Submitted to the Department of Civil Engineering has been examined Thoroughly and satisfactorily accepted in partial fulfillment of the requirement for the Degree of Bachelor of Science (B.Sc.) in Civil Engineering on 18th March 2021.

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CANDIDATE'S DECLARATION

This is hereby declared that this thesis or any part of it has not been submitted elsewhere and any degree.

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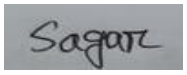
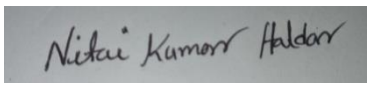
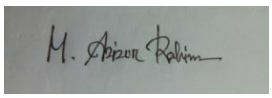
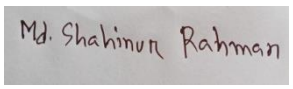
Md. Sagar Molla 

Nitai Kumar Haldar 

Mohammed Azizur Rahi 

Md. Shahinur Rahman 

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This thesis dedicated to our honorable thesis supervisor Saurav Barua. His continuous inspirations made this effort possible.

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Acceptance

Thanks to almighty Allah for his graciousness, unlimited kindness and with the blessing of whom the good deeds are fulfilled.

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Summary

Foot over bridges are accompanied with escalators now in Dhaka city. Several projects have been implemented at present and various such projects will be in the pipeline of the implementation. Our study tries to identify the performance evaluation of existing escalator foot over bridge. We did our study in two phases. Firstly, we did the field survey on how many road users were using foot over bridge on particular sites. The sites are—escalator foot over bridge at Kakoli, Banani and another one is at Airport road just opposite side of the Airport in Dhaka. The other survey was performed through question form taking opinion from public. There are total 298 responses which had been collected through google form. The demographic feature and the attributes data were collected. There were total 13 attributes, which were ranked strongly disagree to strongly agree and converted into numerical scale 1 to 5. The dataset were modeled using feed forward neural network (FFNN), which a widely used class of neural network developed based on biological thinking. The dependent variable of the study was overall condition of the foot over bridge. The model has 58.5% accuracy in training and 60.4% accuracy in testing. The most important attribute obtain was congestion and hawker. The concern authority should take care on these two issues. Most respondents complain on congestion and hawker problems. Government should take necessary step to eradicate hawker from foot over bridge. More pedestrian foot over bridges are required so that demand become less than capacity. Hence, the foot over bridges may not become over crowded. The field survey shows that people are very interested to use escalator foot over bridge. However, considering budget constrain careful feasibility study need to done, before planning escalator foot over bridge in a locality. This study can be extended for other areas and localities and other sorts of pedestrian facility study.

Chapter One

Introduction

1.1 Prefaces

Now-a-days, escalators are constructed to attract pedestrians to use foot over bridge. The construction of escalators with foot over bridge is becoming popular and widely adopted in Dhaka city. Pedestrians also have good response in most of cases, since it lessens their walking while getting up on the Escalator foot over bridge (EFOB). However, the construction cost of EFOB is high comparing to regular foot over bridge without escalator. Since the escalator requires electricity to run, the operation cost and maintenance cost are high.

1.2 Background Studies

Patra et al. (2020) used choice preference of Pedestrian for grade separated crossing. They used Binary logit model and found usage of foot over bridge reduced pedestrian crossing time. Banerjee and Maurya (2020) studied factors those attract pedestrians for foot over bridge. They adopted Multinomial linear regression. They found that security and comfort are the preferences of pedestrians. Chattaraj and Behera (2020) performed capacity estimation of foot over bridge and its influencing factors. They did Regression model and found that foot over bridges need to have adequate space for walking comfortably. Zacharias and Ling (2015) investigated usage between stair and escalator in a shopping center. They performed Correlation and covariance and revealed that walking distance and climbing

height are factors influencing users' preference. Aminuzzaman and Shuvo (2015) studied tendency of avoiding foot over bridge among pedestrians using descriptive statistics. They found that pedestrians in Dhaka are less interested to use foot over bridge while crossing the road.

1.3 Objectives

The objective of this study is to conduct the visual observation and pedestrians' perception on the attributes involved with the escalator pedestrian foot over bridges (EFOB) located in Dhaka city. The study is divided into two types of tasks, firstly the visual observation of existing escalator foot over bridges (EFOB) in Dhaka city considering various attributes such as, cleanness, safety, comfort, accessibility and so on.

Secondly, the study evaluates the pedestrian's perception on the EFOB and identifies the key attribute they consider as the performance measures. A survey form is prepared based on pilot survey and attributes are leveled as different categories so that pedestrians can easily give their opinions. After completion of both visual survey and question survey, data are stored in excel database.

1.4 Summary

Hence, there is a debate raise whether escalator should be constructed for foot over bridge or not. Considering budget constrain of a construction project and efficacy of escalator, it is urgent to evaluate performance and necessity of it. Our study investigates the performance of existing escalator foot over bridge and also tries to identify the key attributes in context of pedestrians' point of view.

Chapter Two

Literature Review

2.1 General

Literature review is the beginning of a research works. We learn about the key components those we have consider while doing the research. The performance evaluation of a foot over bridge consists with question survey and field survey. The question survey aims to obtain peoples' opinion on the subject matter. The field survey gives a clear picture on the usage of the foot over bridge.

2.2 Previous Studies

We are studying on the foot over bridge related literature. We read through several journals and papers. Some of these papers are included in this section in the tabular format below.

Reference	Discussed topics	Method used	Remarks
Patra et al. (2020)	Choice preference of Pedestrian for grade separated crossing	Binary logit model	Usage of foot over bridge reduced pedestrian crossing time

Banerjee and Maurya (2020)	Factors those attract pedestrians for foot over bridge	Multinomial linear regression	Security and comfort are the preferences of pedestrians
Chattaraj and Behera (2020)	Capacity estimation of foot over bridge and its influencing factors	Regression model	Foot over bridges need to have adequate space for walking comfortably.

Reference	**Discussed topics**	**Method used**	**Remarks**
Zacharias and Ling (2015)	Usage between stair and escalator in a shopping center	Correlation and covariance	Walking distance and climbing height are factors influencing users' preference
Aminuzzaman and Shuvo (2015)	Tendency of avoiding foot over bridge among pedestrians	Descriptive statistics	Pedestrians in Dhaka are less interested to use foot over bridge while crossing the road

2.3 Attributes to foot over bridge quality assessment

We have used total 13 attributes in our question survey. There are also three demographic features in our research. We will discuss each of the stuff in this segment of our study. The demographic features are age, gender and occupation. The attributes are-- Escalator foot over bridge is clean (V1), Escalator foot over bridge is time saving than midblock road crossing (V2), Escalator foot over bridge has tolerable steepness of slope (V3), Escalator foot over bridge is Free from hawker (V4), Escalator foot over bridge has adequate security (V5), It takes less walk to reach Escalator foot over bridge (V6), Escalator foot over bridge is Congestion free (V7), Escalator foot over bridge is Easy accessible (V8), Escalator foot over bridge is comfortable (V9) i.e. feel easy to walk, Escalator foot over bridge has adequate visibility at night with sufficient light post (V10), Escalator foot over bridge has good aesthetics (V11), Escalator foot over bridge has adequate roof shade against sun and rain (V12), Escalator foot over bridge has sufficient walking space (V13). The dependent part of the study is Overall condition of escalator foot over bridges of Dhaka city (V14).

2.4 Cleanness

The first and foremost criteria for escalator foot over bridge quality assessment is its cleanness. Nobody else will prefer a dirty foot over bridge. When the road users see that the foot over bridge is spill will dust, soil, dirt and unclean, they will less prefer to walk. Number of foot over bridges are very nasty and occupied by beggars and homeless. They make the foot over bridge dirty. The foot over bridge users sometimes through trash can, unnecessary belongings for their easy. Lack of care, lack of regular cleaning by city corporation sweeper are problems related with it. Sometimes, the city corporation does not

allocate sufficient budget to make the foot over clean. Foot over bridge users are also less concern about the littering of trash cans, polythene bags and plastic products.

The polythene bags and plastic products are non-bio degradable product and harmful to environment. Even littering here and there should be fined. There are 50 dollar fine in Singapore city for littering. Littering behavior make our surrounding nasty. Therefore, we all should avoid this behavior. So the littering activity is directly related to the cleanness of foot over bridge. In authority's side, they should maintain proper schedule to clean up the foot over bridges. Adequate numbers of cleaners and sweepers should be assigned for the task. If not possible by the authority, they can involve third party agency who are expert in the cleaning operation. The tender should be submitted making the specification on that the assigned cleaning agency should have appropriate equipment. New and modern cleaning tools can be added with the existing sweep and brushes. Blower, automatic washing device are required to make the foot over bridge neat and clean.

So, in nut shell, both the authority and the public should help in such a way that the foot over bridges remain clean. It can said that, it is not the duty of a single person or single group of people, we have try by all ourselves to keep the foot over bridges clean. Public awareness and government adequate funds can ensure the issue. Clean foot over bridge is a part of our city to keep clean we have to remember it. Government should assign and allocate specific scheme to make the foot over bridges clean in timely and reasonably manner.

2.5 Time saving

Significant portion of people think that foot over bridges are time wasting. They prefer to cross the road at grade where it is possible, avoid the foot over bridges. It is actually human nature that they try to go through short cut way and avoid difficulty. If we see in the clear eye, we can say that climbing and descending to the stair of foot over bridge is off course time wasting. However, at grade road crossing is easier. We do not need to climb any stair or descend from it in that case. Pedestrians are in hurry and urgent and may be going to their office, schools. So, they obviously try to save their time. And, trying to save time, pedestrian want to avoid foot over bridge.

However, Government makes a solution of it. They introduce escalator with the foot over bridge. Since, there are escalator, people do not need much time to climb up to the foot over bridge. They also need less time to descend down from the foot over bridge. Thus conventional foot over bridges' problem is solved. Adding escalator reduce the travel time and save time. Still many people thinks, escalator foot over takes over time than at grade crossing. At grade crossing stops vehicle in the road and interrupt traffic movement and increase traffic jam, increase accident tendency and hassle to many more other problems.

People should aware of their safety issue. They have to think that life is more important than time. So, using few more time will not make very big difference in their time. Government should construct more foot over bridge with escalator to encourage pedestrian to use foot over bridge. However, this require good amount of budget and fund. Government should

carefully review where it is urgent or whether not. Peoples' demand and Government budget work as tug of war in this case so proper scheme need to develop for this purpose.

2.6 Steepness of stair

Stair steps have some steepness. The steepness and the slope of the stair should be convenience and easy. People of different ages will assess the foot over bridge, so it is a concern issue. Aged people and children may have difficulty in using the high steepness steps and there are sick and patent of heart diseases. So, while construction and design of foot over bridge engineers should care about the steepness of the steps of stair. The main issues of foot over bridge complain is its stair. People are less interested to climb stair during road crossing. So, high steps will demotivate foot over bridge users to take the foot over bridge for road crossing. Contrarily, the very small steps will require more space for foot over bridge and increase the project cost. Hence, it also take into account carefully.

There are code provision for foot over bridge and stair provision. Especially the requirements of steps are given in BNBC code. So, the code provision of stair steps can be followed for construction of foot over bridge also. There are some guidelines in LEGD manuals for foot over bridges. There are also Indian code provision and TCRP guild line for foot over bridge steps. During design engineers should closely consider the height and steepness of the steps so that the foot over bridge is comfortable for the users.

2.7 Hawker problem

Hawkers and vendors occupy road space wherever possible. They even occupy the space in the foot over bridge also. Usually foot over bridge are kept with adequate space so that four

people can walk side by side. The vendors occupy the sides of the foot over bridge width, and it becomes that only two people can merely pass. So, hawkers should not be allowed in the foot over bridge. Though they are poor people. Authority should rehabilitates those people and give them provision to sit with their business in the specific location in the city. Flea markets, weekend markets, pedestrian mall facilities can introduce for the hawkers and vendors. Then, they will leave the foot over bridge. Moreover, strict regulation on not using the space of foot over bridge for business purpose should impose.

Among various identified problems of foot over bridge, the issue of hawker become major concern. So, the quality assessment of foot over bridge much depend on hawker removal. Pedestrians are less reluctant to use foot over bridge due to the occupying the bridge space by hawkers. Though people use to buy goods from those hawkers and get cheap products, they have complain. Hawkers and buyers do bargain and do hassle, which causing nausea to other foot over bridge users. It reduces their walking speed and causing hinder to free movement over the bridge.

2.8 Security issue

Whenever pedestrian moves, they always think about their personal safety and security. People avoid unsecured places and try to walk through safer street. Pick pocket problem is a concern in Dhaka city. So pick pocket happens during too much crowd over the foot over bridge. Sometimes, when there are very few pedestrian over the bridge at night, hijacking is also occurred. So, people avoid those foot over bridge to keep them safe from hijacker and muggers. So, proper authority should take action on it. Police and law enforcement agencies

are active against those thugs and hijackers. It is the way that the safety of the foot over bridge can be ensured. Authority can deploy para police force like Ansar for the constant safety of the foot over bridge or petro policing are required for constant surveillance.

The hijackers and thugs should be caught and jailed. There are also provision for rehabilitates those thugs so that they will not re-enter in to their old service again. Therefore, additional budget to ensure for constant security and safety along with the city wise safety. Actually separate budget do not need for the safety of foot over bridge. Inclusion of foot over bridge while police patrolling and surveillance carefully can make foot over bridge secure. It will encourage people to use foot over bridge more and avoid jay walking on the street. Jay walking increase accident tendency and make pedestrian more accident prone.

2.9 Walking long distance

Most of people think that foot over bridge require long walk compare to at grade. The opinion is true in some extent. Obviously, distance require to walk in a place through at grade is much lower than distance required to walk by climbing and descending stairs of foot over bridge. Users should consider the issue of safety during crossing midblock of road segment. In that point of view walking little more is not a matter of content. Another topic comes to consider here. That is, the foot over bridge should be located appropriate location. If the position of the foot over bridges are not in the proper locations, pedestrian detour the foot over bridge. They always try to find the alternatives and short-cut ways.

During designing and planning foot over bridge, it is required to do a feasibility study and compare a relative study on locating the foot over bridge nearby in various positions. The

VISSIM software has a simulation facility to model pedestrian movement. The location of foot over bridge should be based on field data considering pedestrians' demand on where the foot over bridge should be located. The location of the foot over bridge should be assigned by optimizing its position at different viewpoints. Peoples' demand is the main criteria for this feasibility study. So, the feasibility study can be based on question survey on the commuter of the locality and it can be also based on finding the location where most people use to cross the road. If the planner built the foot over bridge on the location where most people are used to cross, the foot over bridge will be more popular and people will not reluctant to use it. Otherwise, if the foot over bridge is positioned at a remote or less popular side of a locality, it will remain unused. People avoid the foot over bridge in that perspectives. So, popular choice is a matter to consider and avoid long walking distance while construction foot over bridge.

For Example, three position of foot over bridges are proposed. Location A is near a school, where significant numbers of pedestrian will probably access the foot over bridge. Location B is near a footpath, where accessibility is little difficult and the location is less acquaintance to the locality. And the Location C is the third position. Where it is almost remote the both school and local bazar. The walking distance required for Location A foot over bridge is on average 300ft. Same for location B and location C is 650 ft and 900 ft respectively. People will prefer to use the foot over bridge located at A. If the planner build the foot over bridge at either B or C locations, it will be less popular and people will object or complain on the issue. There will be a tendency to avoid the foot over bridge in those cases.

2.10 Congestion at over bridge

People do not like pedestrian congestion. If walking is block, they have to wait for a long time. There are crowd of people and it is very much cumbersome. Pedestrians feel uneasy while moving on the deck of the foot over bridge. In that case, people prefer to cross the road at grade avoid the over bridge. So, this is an important aspect which need to consider while assessing performance of the service quality of the foot over bridge. Our country is an over populated country. Heads of people in the crowd, overwhelming congestion is our day to day phenomena. People are looking for some free space and open area to walk. Hence, congestion of people on the foot over bridge will demotivate them.

One of the possible solution is to provide adequate pedestrian facilities around the city space. We have lack of foot path, pedestrian malls and over bridges. There are only 2-3 under pass facilities for pedestrian. However, the city is crumbed with more than 15 million population. These are quite inadequate for the pedestrian. They force to walk along the side of the road occupying road space. Tackle and obstruct the vehicle on the road, create confusion and haphazard to the overall traffic system. Therefore, we need sufficient number of pedestrian foot over bridge and encourage people so that they avoid jay walking in the midblock of the road. It will help in the two ways. Firstly, it reduce vehicle pedestrian conflict and reduce pedestrian related accident. On the other hand, pedestrian creates congestion on the road, reduce free flow movement of vehicle. As a result, overall chaos occur in the entire traffic system.

2.11 Easy accessible

One of complain about the foot over bridges of Dhaka city are those are not easy to access. The entrance of the foot over bridges are blocked by vendors, posters and play cards. Sometimes, it is difficult to find the entrance of the foot over bridge. Whoever can get into the foot over bridge, the walking space is very tiny and narrow so that still the accessibility is not turn out. While getting down the stairs and steps of the stairs are dirty, shamble and torn out. The steel plates of the bridges are tear apart due to lack of maintenance. Some of the steps of the steel stairs are broken and fall apart, which become risky to walk even at the day time.

2.12 Comfortable

Whenever the performance of the foot over bridges are come, it has to take the issue of comfort. What people thinks in terms of comfort from the foot over bridge, it is needed to know. In order to provide adequate facilities ensuring comfort while walking in the foot over bridge is essential. When people feel discomfort they will not use the foot over bridge. They may use the facility once or twice. However, they will not prefer to use it for road crossing all the time. For example, there are two facilities one is foot over bridge and another one is zebra crossing. Obviously, people will choose zebra crossing most of the cases. Since, it is more comfortable for walking, do not need to climb stairs or getting down from the stairs.

2.13 Adequate Light post

Street lights should be provided in the foot over bridge for adequate visibility. Usually, street lights are not on the foot over bridge directly. Therefore, city authority will provide street

light nearby the foot over bridge so that there is visibility problem while walking over it during night time. Adequate visibility will also reduce night time crime and solve the problem of safety issue. The street light should be placed and aligned following proper guideline of the city transportation planning manuals. Proper maintenance is also necessary. Most of cases, it is seen that, there are street lights and post. However, those are out of order or there are mal functioning of the lights. As a result the purpose the street light may not be served.

2.14 Adequate Roof shade

Now, most of the foot over bridges have shades. It is a good approach to enhance the comfort of the facilities. During rain and hot sun, people used to avoid foot over bridge because of inconvenience. Installation of roof shade is not enough, it is required to do routine maintenance of the shades and cleaning those shades.

2.15 Aesthetics

Aesthetics of the foot over bridge will increase entire beautification of the area of the urban region. It also attract people and clearly visible from the nearby. So that, people do not need to search for foot over bridge where those are located. Though it seem to less prefer issue in context of our country. It is crucial for most of the developing country. Aesthetic considering while implementing the foot over bridge construction project is urgent.

2.16 Sufficient walk space

Pedestrian wants sufficient walk space on the foot over bridge. If the walkway of the foot over bridge is too narrow, people face unsafe and feel discomfort. They dislike to use the foot over facility in that situation. Whenever the foot over bridge is planned to constructed, engineers should follow proper code provision so that sufficient walk space is ensured. Transportation cooperative research program (TCRP) have lot of research and publish numbers of manuals on the topic. Designer can follow their guide line while doing planning.

2. 17 Summary

This section of the discussed on the key features of foot over bridge. We learn about the requirements of the performance evaluation of the foot over bridge. Also, we come to know about which are the issues that people concern about regarding the bridge. The next segment of the study describes methods used in this study.

Chapter Three

Methodology and data collection

3.1 General

The data analysis is performed using SPSS v.16.0 software. Descriptive study and correlation matrix give the interdependency within attributes. A mathematical model developed using Feed forward Neural Network (FFNN) is adopted to interpret the dataset. The fitness of the FFNN model and ranking of the attributes are performed to evaluate the efficacy of the study.

3.2 Feed Forward neural network (FFNN)

Feed forward neural network (FFNN) is a type of neural network which is adopted for solving classification problem. FFNN consist with a number of nodes arranged in multiple layers which are mathematical processing unit. Each mode of a layer connected with all modes of previous layer. The connects are the equal rather they vary with different strength of weightage value. The weights on these connections encode the dataset information of the network. Dataset enters through the input layer and passes through the network, layer by layer, until it reaches the output layer. During mathematical operation, when it acts as a classifier, there is no feedback between layers. Hence it is named as feed forward neural network (FFNN).

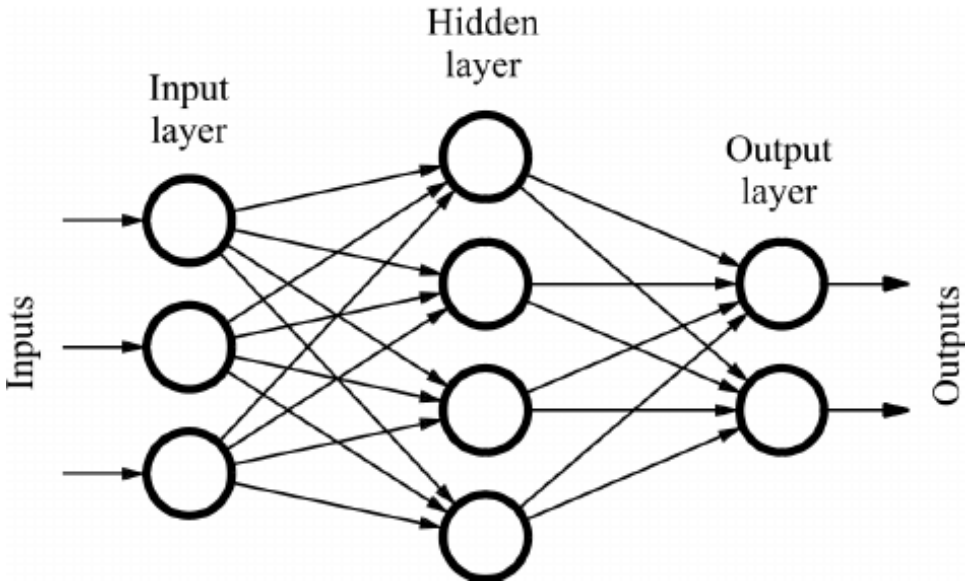


Figure 3.1: Feed Forward neural network (FFNN)

3.3 Data collection

A survey form was prepared from based on pilot survey, literature review and reconnaissance survey. The demographic information of the survey form are: (1) Age, (2) Gender and (3) Occupation. The attributes of the survey are: (1) Cleanness (V1), (2) time saving (V2), (3) tolerable steepness of stair (V3), (4) Hawker free (V4), (5) Adequate security (V5), (6) Less walk (V6), (7) Congestion free (V7), (8) Easy accessible (V8), (9) Comfortable (V9), (10) Adequate street light (V10), (11) Aesthetic (V11), (12) Adequate roof shade (V12) and(13) Sufficient walking space (V13). The target (dependent) variable of the data is overall condition.

The attributes are demarcated as strongly disagree, disagree, neutral, agree and strongly agree classes. The overall condition is levelled as very poor, poor, fair, good and excellent.

The levels of attributes and the overall condition are marked as numerical designation from 1 to 5 accordingly.

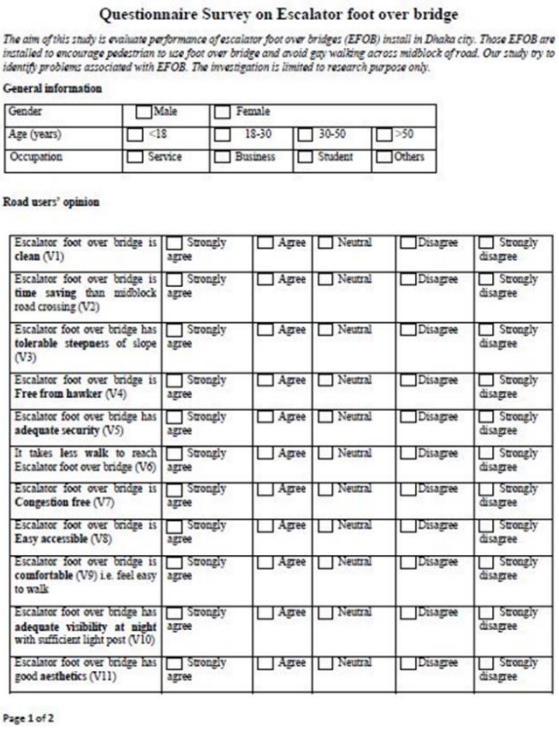
Strongly disagree, disagree, neutral, agree and strongly agree are designated as 1, 2, 3, 4 and 5 respectively. Similarly very poor, poor, fair, good and excellent are marked as 1 to 5 respectively.

Numbers of pedestrian using the escalator foot over bridge are also recorded in the survey form.

The survey was conducted on two sites.

1. Banani escalator foot over bridge near kakoli
2. Escalator foot over bridge near Airport

Pedestrian count data was collected at 11:00am to 12:00pm in the month of December, 2020. Photographs and remarks on various attributes of those foot over bridges were recorded. Question survey was performed through a designed survey from. Total 298 respondents were precipitated on the survey for giving their opinions on the existing foot over bridges.



Questionnaire Survey on Escalator foot over bridge

The aim of this study is evaluate performance of escalator foot over bridges (EFOB) install in Dhaka city. Those EFOB are installed to encourage pedestrian to use foot over bridge and avoid guy walking across midblock of road. Our study try to identify problems associated with EFOB. The investigation is limited to research purpose only.

General information

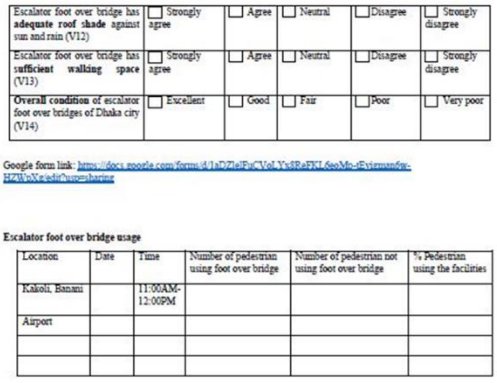
Gender	☐ Male	☐ Female		
Age (years)	☐ <18	☐ 18-30	☐ 30-50	☐ >50
Occupation	☐ Service	☐ Business	☐ Student	☐ Others

Road users' opinion

Escalator foot over bridge is **clean** (V1)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **time saving** than midblock road crossing (V2)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **tolerable steepness** of slope (V3)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **Free from hawker** (V4)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **adequate security** (V5)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
It takes **less walk** to reach Escalator foot over bridge (V6)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **Congestion free** (V7)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **Easy accessible** (V8)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **comfortable** (V9) i.e. feel easy to walk	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **adequate visibility at night** with sufficient light post (V10)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has good **aesthetics** (V11)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree

Page 1 of 2

Figure 3.2: Survey form first page



Escalator foot over bridge has **adequate roof shade** against sun and rain (V12)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **sufficient walking space** (V13)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Overall condition of escalator foot over bridges of Dhaka city (V14)	☐ Excellent	☐ Good	☐ Fair	☐ Poor	☐ Very poor

Google form link: https://docs.google.com/forms/d/1aDZIelFuCVoLYs8ReFKL6eoMo-tEvimumfgv-HZWwXc/edit?usp=sharing

Escalator foot over bridge usage

Location	Date	Time	Number of pedestrian using foot over bridge	Number of pedestrian not using foot over bridge	% Pedestrian using the facilities
Kakoli, Banani		11:00AM-12:00PM			
Airport					

Page 2 of 2

Figure 3.3: Survey form page second

Figure 3.4: Survey site photographs

Chapter Four

Data Analysis

4.1 General

We input the visual observation information into excel format from recorded hardcopy. The data were numbers of pedestrian using the escalator foot over bridge (EFOB) and designate the surveyed EFOBs in terms attributes mentioned in the survey form The question survey data obtained from pedestrians were entered into google form and import to excel format. Later all dataset were transferred to statistical software SPSS v. 16.0 for further analysis. SPSS is a powerful statistical software which has been used around the world widely.

4.2 Visual survey

Since there is no at grade road crossing provision at the FEOB near Airport, 100% pedestrian use the facility while crossing the road. Most of the pedestrian are using the both escalator foot over bridge (FEOB).

Table 4.1: Visual surveys

Nos. of foot over bridge users				
Locations	Time	Number of pedestrian using foot over bridge	Number of pedestrian not using foot over bridge	% Pedestrian using the facilities
Banani	11:00AM-12:00PM	1284	35	97.35%
Airport		2520	0	100%

Visual assessment showed that overall conditions of escalator foot over bridge (EFOB) are ranked as good. Hawker problem (V4) and cleanness (V1) are marked as concerning issue for both the EFOBs.

Table 4.2: Visual assessments

Attributes	**Escalator foot over bridge, Locations: 1. Airport, 2. Banani**	
	Remarks level	Scale point
Cleanness_V1	Disagree	2
Time_Consuming_Less_V2	Strongly agree	5
Stair_Steepness_Less_V3	Agree	4

Hawker_free_V4	Strongly disagree	1
Security_adequate_V5	Agree	4
Walking_Less_V6	Agree	4
Congestion_free_V7	Neutral	3
Easy_Accessible_V8	Strongly agree	5
Comfortable_V9	Strongly agree	5
Light_post_sufficient_V10	Agree	4
Asthetic_good_V11	Agree	4
Roof_shade_adequate_V12	Strongly agree	5
Walk_space_sufficient_V13	Strongly agree	5
Overall condition	**Good**	**4**

4.3 Question survey

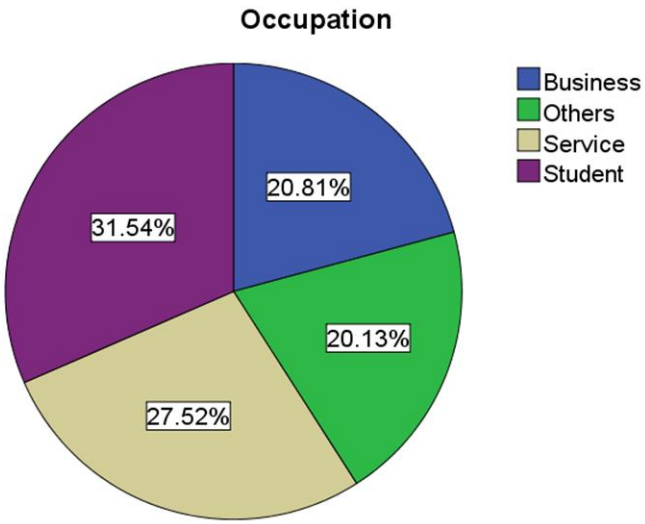
Total collected 298 responses are divided into training and testing for cross validation. Training and testing data are comprise with approximately 70% and 30% respectively.

Table 4.3: data splits

Case Processing Summary			
		N	Percent
Sample	Training	207	69.5%
	Testing	91	30.5%
Valid		298	100.0%

Excluded	0	
Total	298	

54.36% respondents were male and 45.64% respondents were female. Student and service holder comprise close to 60% responses. 32.89% respondents have age in between 18-30 years.



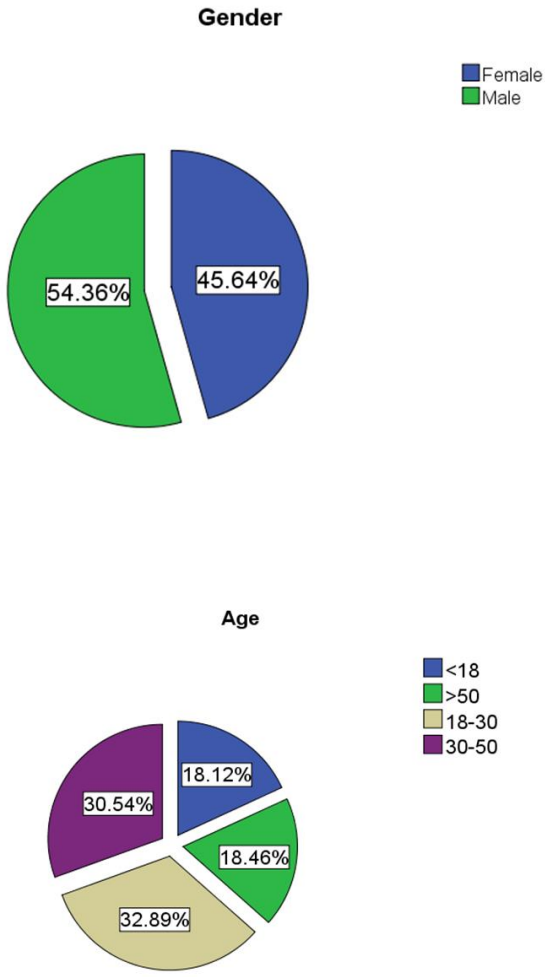


Figure 4.3: Demographics of responses

4.4 Levels of Attributes

>40% respondents agree with the most of the attributes of the escalator foot over bridge (EFOB) and they are satisfied. The highest 32.9% responses opinion that EFOB are not hawker free (V4).

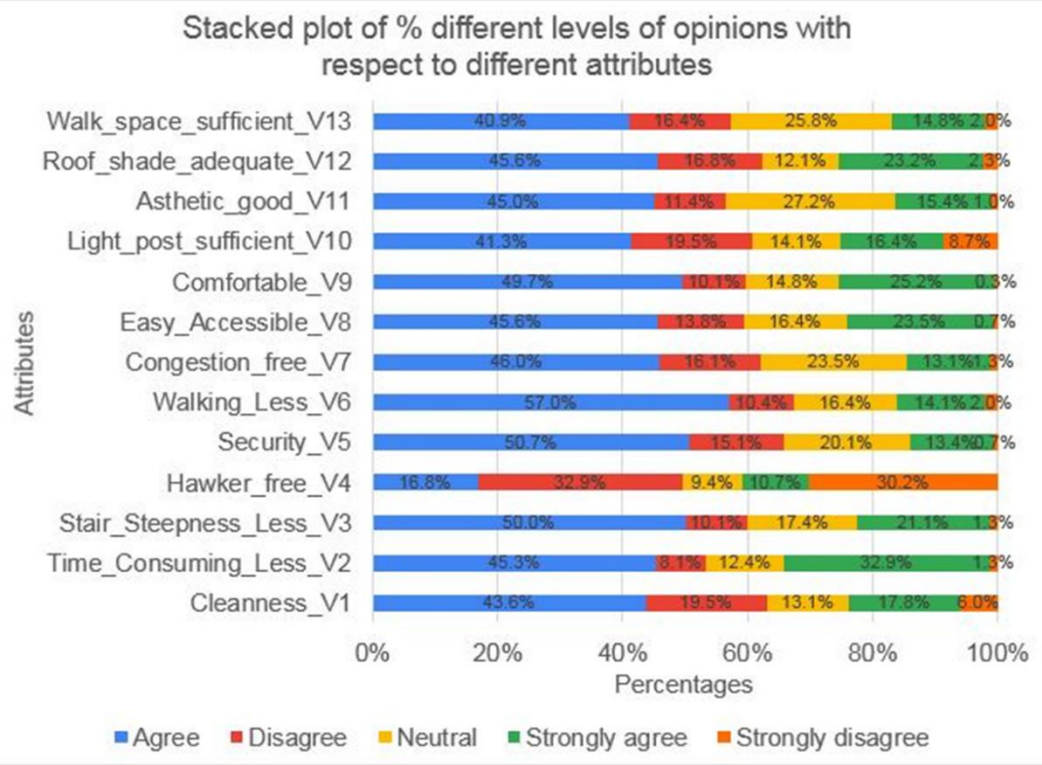


Figure 4.5: Stacked plot of attributes

4.5 Network information

The proposed Feed Forward Neural Network (FFNN) have 13 input variables, which are the attributes of the model. The dependent variable of the FFNN model is overall condition (V14).

Network Information			
Input Layer	Covariates	1	Cleanness_V1
		2	Time_Consuming_Less_V2
		3	Stair_Steepness_Less_V3
		4	Hawker_free_V4
		5	Security_adequate_V5

		6	Walking_Less_V6
		7	Congestion_free_V7
		8	Easy_Accessible_V8
		9	Comfortable_V9
		10	Light_post_sufficient_V10
		11	Asthetic_good_V11
		12	Roof_shade_adequate_V12
		13	Walk_space_sufficient_V13
	Number of Units[a]		13
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		2
	Number of Units in Hidden Layer 1[a]		9
	Number of Units in Hidden Layer 2[a]		7
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	Overall_V14
	Number of Units		5
	Activation Function		Softmax
	Error Function		Cross-entropy

a. Excluding the bias unit

There are 2 hidden layers in the proposed FFNN model. The output layer is categorized as 5 levels of overall condition ranging very poor (1), poor (2), fair (3), good (4) and excellent (5).

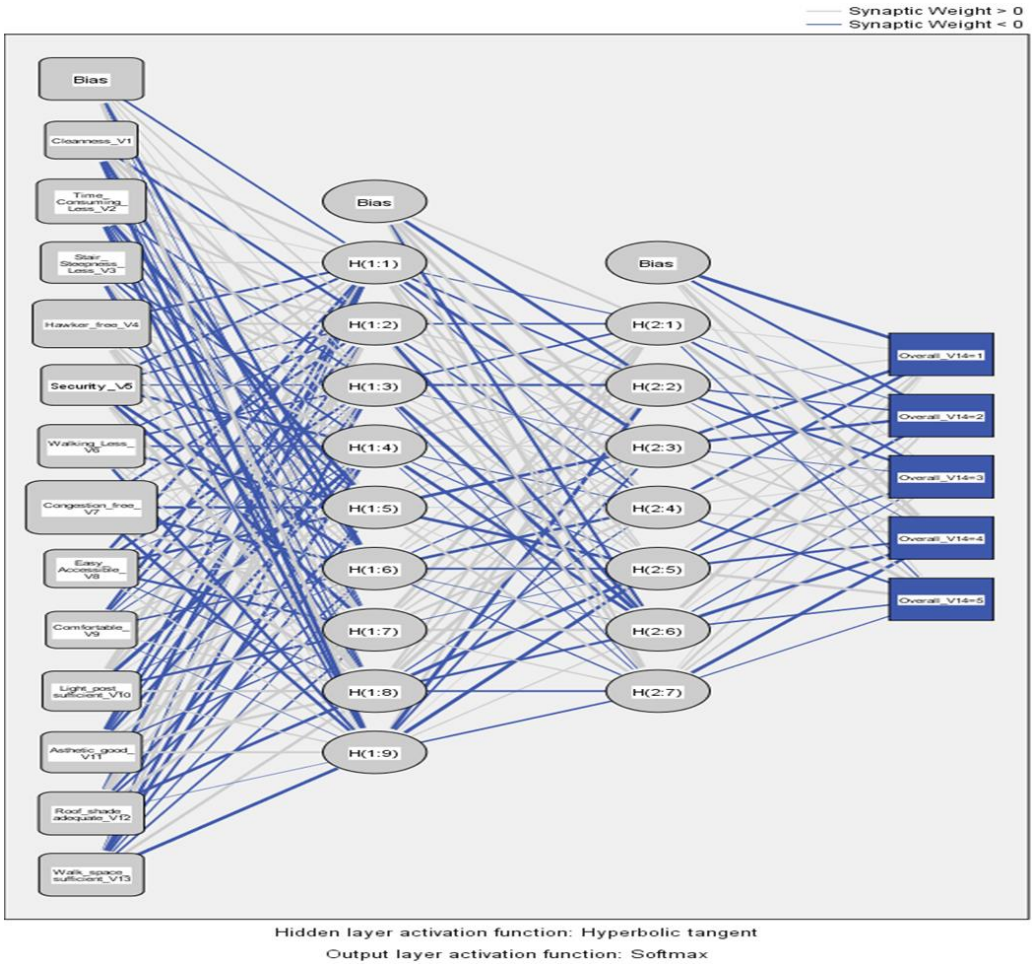


Figure 4.4: Feed forward Neural Network

4.6 Classification

The proposed feed forward neural network (FFNN) have training and testing accuracy 58.5% and 60.4% respectively. Both training and testing accuracy >50%.

Table 4.4: Classification of attributes

Classification							
		Predicted					
Sample	Observed	1	2	3	4	5	Percent Correct
Training	1	0	2	1	3	0	.0%
	2	0	6	4	16	1	22.2%
	3	0	3	5	23	1	15.6%
	4	0	1	1	106	1	97.2%
	5	0	0	0	29	4	12.1%
	Overall Percent	.0%	5.8 %	5.3 %	85.5 %	3.4%	**58.5%**
Testing	1	0	0	0	4	0	.0%
	2	0	3	0	9	1	23.1%
	3	0	2	5	6	0	38.5%
	4	0	0	1	45	1	95.7%
	5	0	0	0	12	2	14.3%
	Overall Percent	.0%	5.5 %	6.6 %	83.5 %	4.4%	**60.4%**
Dependent Variable: Overall_V14							

Receiver operating characteristic (ROC) curve shows that all five levels lie right side (upper part) of the 45º line. The area under the curve values are >0.5 in all cases.

Area Under the Curve		
		Area
Overall_V14	1	.815
	2	.776
	3	.714
	4	.760
	5	.758

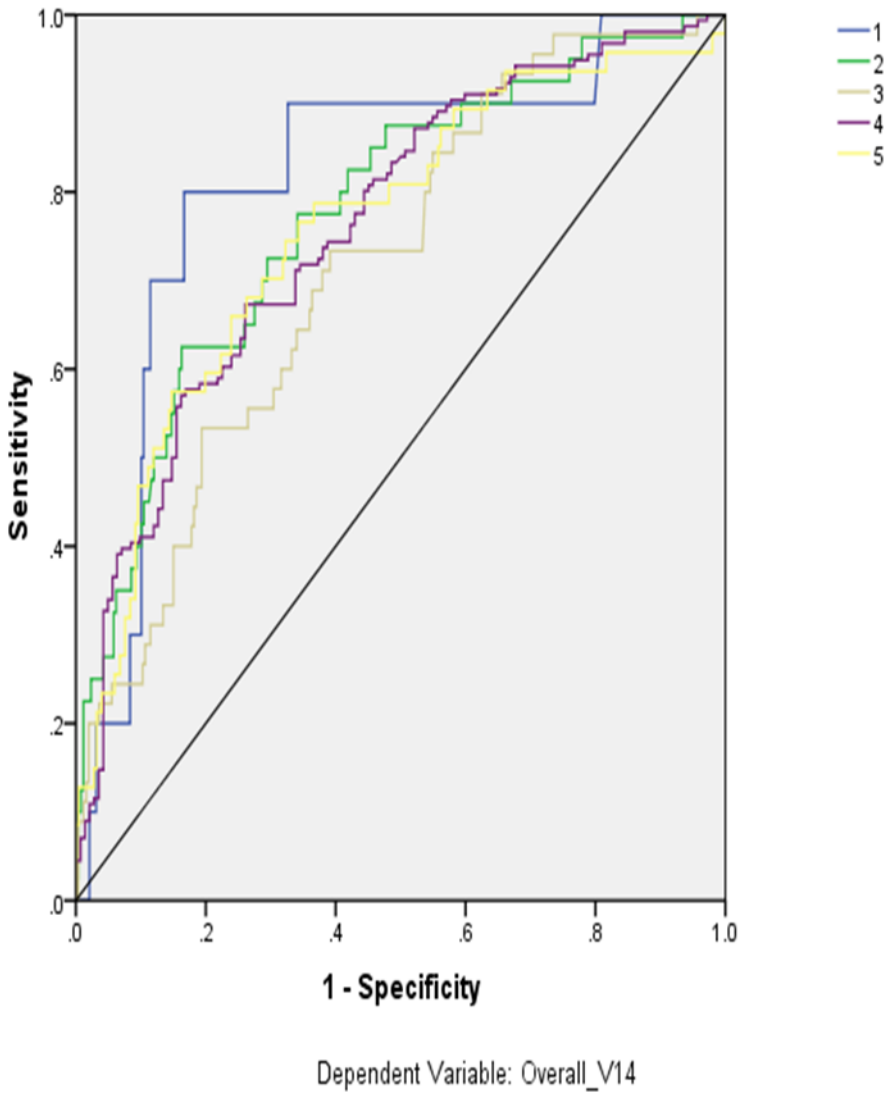


Figure 4.6: ROC curve of the dataset

4.7 Importance of attributes

Congestion (V7) is the most important attribute in the proposed FFNN model. Hawker (V4), less time consumption (V2), less walking required (V6) and sufficient walking space (V13) are other important attributes for pedestrians' perception.

Table 4.5: Importance of attributes

Independent Variable Importance		
	Importance	Normalized Importance
Cleanness_V1	.044	28.9%
Time_Consuming_Less_V2	.092	59.9%
Stair_Steepness_Less_V3	.070	45.4%
Hawker_free_V4	.115	74.7%
Security_V5	.066	43.3%
Walking_Less_V6	.083	54.3%
Congestion_free_V7	.153	100.0%
Easy_Accessible_V8	.048	31.4%
Comfortable_V9	.040	26.1%
Light_post_sufficient_V10	.060	39.2%
Asthetic_good_V11	.067	43.6%
Roof_shade_adequate_V12	.082	53.1%
Walk_space_sufficient_V13	.079	51.7%

Congestion free (V7), hawker free (V2) and less time consumption are the major concerns in context of pedestrian response.

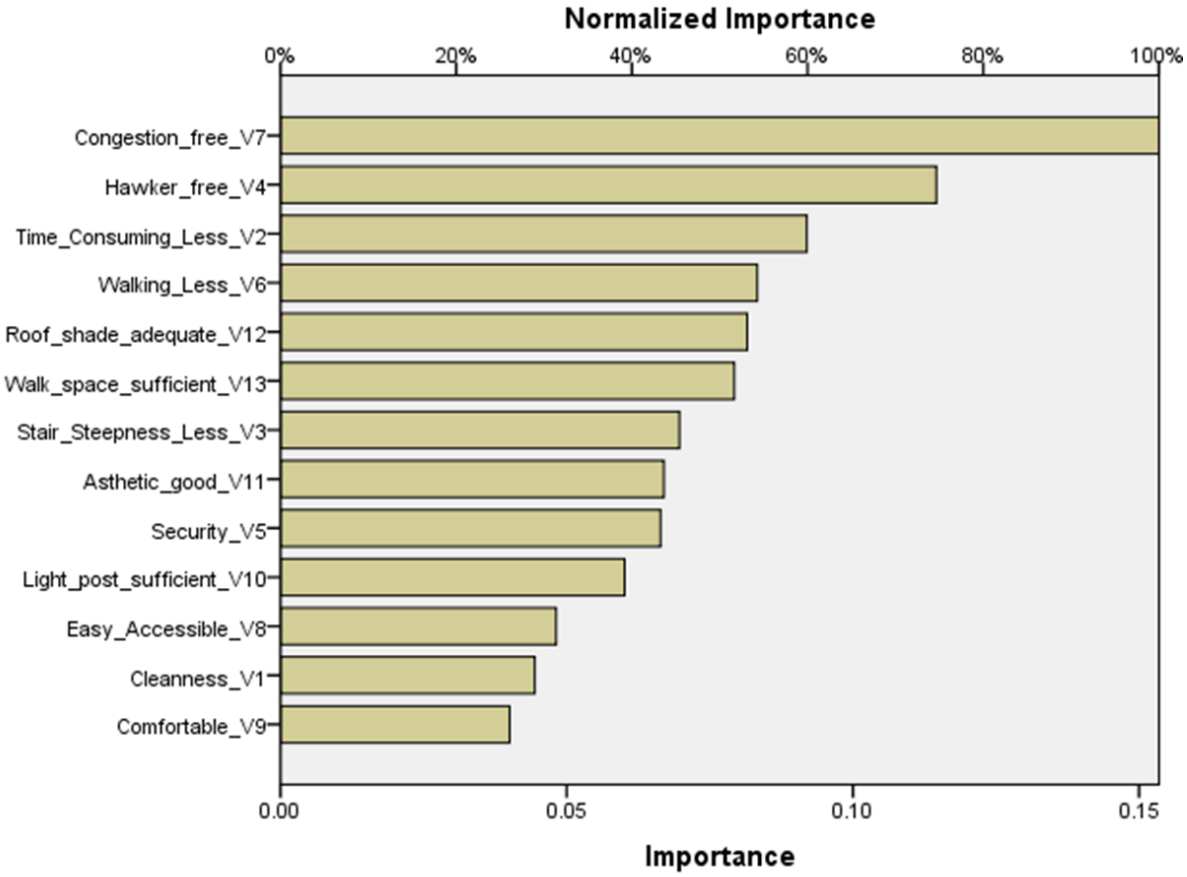


Figure 4.7: Importance of attributes

Chapter Five

Conclusion

5.1 General

Though existing escalator foot over bridges (EFOB) are marked good in pedestrian's perception, however, issues of hawker should be considered carefully by concerned authority. Moreover, both of the surveyed EFOB have very high pedestrian demand >1200 person/hr and construction of additional foot over bridges nearby are required to avoid congestion.

5.2 Findings

Most of the people are interested to use escalator foot over bridge (EFOB). Especially, where restriction via guard rail are provided to hinder pedestrian to cross the road at grade, the maximum benefit of the EFOB can be gained. Hawker problem is a major concern which came out through both visual and question surveys. Pedestrian are concerned about congestion and time while choosing the EFOB for road crossing. Overall facilities of the surveyed EFOB at Banani and Airport are satisfactory. The proposed FFNN have 58.5% training accuracy and 60.4% testing accuracy.

5.3 Recommendation

The prior studies on foot over bridge show that pedestrians are less interested to use foot over bridge due to difficulty in climbing the stair. Escalator foot over bridge (EFOB) solve the problems of climbing stair. It makes ease and comfort for pedestrian compare to

conventional foot over bridge. However, issues of budget, importance, demand for EFOB need to be investigated for feasibility study in a particular locations. Existing EFOB have positive review from pedestrian and this will encourage to construct more such foot over bridges around Dhaka city where it is needed.

5.4 Summary

Side-by-side, enforcing pedestrian to restrict at grade road crossing through guard rail is mandatory. Safety and cleanness should be ensured for all EFOBs. Adequate Street light for night time visibility and roof shade for protecting against sun, rain are also essential as well.

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Appendix

Visual survey

Nos. of foot over bridge users				
Location	Time	Number of pedestrian using foot over bridge	Number of pedestrian not using foot over bridge	% Pedestrian using the facilities
Banani	11:00AM -12:00PM	1284	35	97.35%
Airport		2520	0	100%

Attributes	Escalator foot over bridge, Locations: 1. Airport, 2. Banani	
	Remarks level	Scale point
Cleanness_V1	Disagree	2
Time_Consuming_Less_V2	Strongly agree	5
Stair_Steepness_Less_V3	Agree	4
Hawker_free_V4	Strongly disagree	1
Security_adequate_V5	Agree	4
Walking_Less_V6	Agree	4
Congestion_free_V7	Neutral	3
Easy_Accessible_V8	Strongly agree	5
Comfortable_V9	Strongly agree	5
Light_post_sufficient_V10	Agree	4
Asthetic_good_V11	Agree	4
Roof_shade_adequate_V12	Strongly agree	5
Walk_space_sufficient_V13	Strongly agree	5
Overall condition	Good	4

Questionnaire Survey on Escalator foot over bridge

The aim of this study is evaluate performance of escalator foot over bridges (EFOB) install in Dhaka city. Those EFOB are installed to encourage pedestrian to use foot over bridge and avoid gay walking across midblock of road. Our study try to identify problems associated with EFOB. The investigation is limited to research purpose only.

General information

Gender	☐ Male	☐ Female		
Age (years)	☐ <18	☐ 18-30	☐ 30-50	☐ >50
Occupation	☐ Service	☐ Business	☐ Student	☐ Others

Road users' opinion

Escalator foot over bridge is **clean** (V1)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **time saving** than midblock road crossing (V2)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has	☐ Strongly	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly

tolerable steepness of slope (V3)	agree				disagree
Escalator foot over bridge is **Free from hawker** (V4)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **adequate security** (V5)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
It takes **less walk** to reach Escalator foot over bridge (V6)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **Congestion free** (V7)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **Easy accessible** (V8)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge is **comfortable**	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree

(V9) i.e. feel easy to walk					
Escalator foot over bridge has **adequate visibility at night** with sufficient light post (V10)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has good **aesthetics** (V11)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **adequate roof shade** against sun and rain (V12)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Escalator foot over bridge has **sufficient walking space** (V13)	☐ Strongly agree	☐ Agree	☐ Neutral	☐ Disagree	☐ Strongly disagree
Overall condition of escalator foot	☐ Excellent	☐ Good	☐ Fair	☐ Poor	☐ Very poor

over bridges of Dhaka city (V14)					

Google form link: https://docs.google.com/forms/d/1aDZlelFuCVoLYx8ReFKL6eoMp-tEyigman6w-HZWpXg/edit?usp=sharing

Escalator foot over bridge usage

Location	Date	Time	Number of pedestrian using foot over bridge	Number of pedestrian not using foot over bridge	% Pedestrian using the facilities
Kakoli, Banani		11:00AM -12:00PM			
Airport					

Escalator foot over bridge is Easy accessible (V8)	Escalator foot over bridge is comfortable (V9) i.e. feel easy to walk	Escalator foot over bridge has adequate visibility at night with sufficient light post (V10)	Escalator foot over bridge has good aesthetics (V11)	Escalator foot over bridge has adequate roof shade against sun and rain (V12)	Escalator foot over bridge has sufficient walking space (V13)	Overall condition of escalator foot over bridges of Dhaka city (V14)
Agree	Disagree	Neutral	Agree	Strongly agree	Strongly agree	Good
Neutral	Strongly agree	Neutral	Neutral	Strongly agree	Neutral	Good
Agree	Agree	Disagree	Agree	Strongly agree	Strongly agree	Good
Agree	Agree	Disagree	Agree	Agree	Agree	Good
Neutral	Neutral	Neutral	Agree	Agree	Agree	Good
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Good
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Good
Strongly agree	Agree	Neutral	Neutral	Strongly disagree	Neutral	Excellent
Strongly agree	Agree	Strongly disagree	Agree	Strongly disagree	Neutral	Good
Strongly agree	Agree	Strongly disagree	Agree	Strongly disagree	Neutral	Good
Strongly agree	Agree	Neutral	Agree	Strongly agree	Neutral	Good

Strongly agree	Agree	Neutral	Agree	Strongly agree	Neutral	Good
Strongly agree	Neutral	Agree	Neutral	Agree	Disagree	Excellent
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Good
Disagree	Disagree	Disagree	Neutral	Neutral	Agree	Good
Strongly agree	Agree	Neutral	Agree	Strongly agree	Neutral	Good
Agree	Agree	Strongly agree	Agree	Strongly agree	Agree	Excellent
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Good
Disagree	Neutral	Neutral	Neutral	Agree	Neutral	Good
Disagree	Disagree	Agree	Neutral	Neutral	Neutral	Good
Neutral	Neutral	Strongly agree	Agree	Strongly agree	Agree	Excellent
Agree	Agree	Disagree	Disagree	Neutral	Agree	Excellent
Agree	Neutral	Agree	Neutral	Neutral	Neutral	Fair
Agree	Agree	Neutral	Strongly agree	Disagree	Disagree	Good
Agree	Agree	Neutral	Neutral	Disagree	Neutral	Good
Neutral	Disagree	Disagree	Neutral	Disagree	Neutral	Excellent
Neutral	Agree	Agree	Disagree	Neutral	Neutral	Good
Strongly disagree	Neutral	Neutral	Neutral	Strongly agree	Strongly agree	Good
Agree	Agree	Disagree	Disagree	Disagree	Neutral	Excellent
Neutral	Neutral	Disagree	Disagree	Strongly disagree	Agree	Fair
Disagree	Strongly agree	Strongly agree	Neutral	Disagree	Neutral	Good
Disagree	Neutral	Agree	Agree	Disagree	Neutral	Excellent

Agree	Disagree	Disagree	Agree	Disagree	Agree	Fair
Disagree	Disagree	Neutral	Agree	Disagree	Agree	Fair
Strongly agree	Agree	Neutral	Neutral	Disagree	Agree	Good
Agree	Strongly agree	Disagree	Neutral	Agree	Agree	Good
Strongly agree	Agree	Strongly agree	Neutral	Agree	Strongly agree	Excellent
Agree	Agree	Agree	Neutral	Neutral	Agree	Fair
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Disagree	Strongly agree	Agree	Neutral	Disagree	Agree	Fair
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Agree	Strongly agree	Agree	Neutral	Agree	Strongly agree	Fair
Agree	Agree	Agree	Strongly agree	Strongly agree	Neutral	Good
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Agree	Agree	Agree	Agree	Agree	Strongly agree	Poor
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Agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Good
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Excellent
Agre	Strongly	Strongly	Stron	Strongly	Agree	Poor

e	agree	agree	gly agree	agree		
Agree	Agree	Agree	Agree	Agree	Agree	Fair
Agree	Agree	Agree	Agree	Agree	Neutral	Fair
Strongly agree	Strongly agree	Strongly disagree	Strongly agree	Strongly agree	Agree	Good
Neutral	Agree	Neutral	Agree	Agree	Strongly agree	Excellent
Agree	Agree	Agree	Agree	Agree	Strongly agree	Excellent
Agree	Neutral	Strongly disagree	Neutral	Agree	Agree	Good
Strongly agree	Strongly agree	Strongly disagree	Strongly agree	Agree	Neutral	Good
Neutral	Disagree	Strongly disagree	Neutral	Agree	Neutral	Fair
Strongly agree	Strongly agree	Disagree	Neutral	Neutral	Agree	Good
Agree	Strongly agree	Disagree	Neutral	Neutral	Agree	Good
Strongly agree	Agree	Strongly agree	Strongly disagree	Strongly agree	Strongly agree	Excellent
Agree	Strongly agree	Strongly agree	Disagree	Strongly agree	Strongly agree	Excellent
Neutral	Neutral	Agree	Disagree	Agree	Agree	Good
Agree	Strongly agree	Agree	Strongly disagree	Agree	Agree	Good
Neutral	Strongly agree	Strongly agree	Disagree	Agree	Agree	Fair
Agree	Neutral	Strongly agree	Disagree	Agree	Neutral	Good
Neutral	Strongly agree	Strongly agree	Disagree	Neutral	Neutral	Good
Agree	Strongly agree	Strongly agree	Agree	Strongly agree	Strongly agree	Good
Strongly agre	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Good

e						
Strongly agree	Agree	Neutral	Agree	Agree	Neutral	Good
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Agree	Good
Strongly agree	Agree	Neutral	Agree	Agree	Agree	Good
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Good
Strongly agree	Agree	Neutral	Agree	Strongly agree	Neutral	Excellent
Strongly agree	Agree	Disagree	Agree	Strongly agree	Neutral	Excellent
Neutral	Agree	Disagree	Agree	Strongly agree	Neutral	Good
Strongly agree	Agree	Strongly disagree	Agree	Strongly agree	Neutral	Very poor
Strongly agree	Agree	Neutral	Neutral	Neutral	Agree	Poor
Strongly agree	Agree	Neutral	Agree	Strongly agree	Neutral	Fair
Agree	Strongly agree	Disagree	Agree	Strongly agree	Strongly agree	Good
Agree	Strongly agree	Strongly disagree	Neutral	Agree	Agree	Excellent
Strongly agree	Agree	Disagree	Agree	Neutral	Strongly agree	Excellent
Strongly agree	Agree	Disagree	Neutral	Neutral	Agree	Excellent
Strongly agre	Neutral	Strongly disagree	Neutral	Agree	Neutral	Good

e						
Strongly agree	Strongly agree	Disagree	Strongly agree	Strongly agree	Strongly agree	Excellent
Agree	Agree	Disagree	Agree	Disagree	Agree	Good
Agree	Strongly agree	Disagree	Agree	Neutral	Neutral	Good
Strongly agree	Agree	Neutral	Strongly agree	Neutral	Agree	Good
Strongly agree	Agree	Agree	Strongly agree	Strongly agree	Agree	Excellent
Strongly agree	Strongly agree	Disagree	Agree	Disagree	Disagree	Poor
Disagree	Agree	Agree	Agree	Agree	Neutral	Fair
Disagree	Neutral	Disagree	Neutral	Strongly agree	Neutral	Good
Strongly agree	Strongly agree	Disagree	Agree	Agree	Agree	Excellent
Strongly agree	Agree	Disagree	Agree	Strongly agree	Agree	Good
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Neutral	Agree	Disagree	Neutral	Neutral	Strongly agree	Excellent
Agree	Agree	Strongly disagree	Neutral	Agree	Agree	Excellent
Strongly agre	Agree	Neutral	Neutral	Neutral	Agree	Good

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Agree	Strongly agree	Disagree	Agree	Strongly agree	Agree	Excellent
Agree	Agree	Disagree	Neutral	Agree	Strongly agree	Excellent
Agree	Agree	Neutral	Agree	Agree	Disagree	Fair
Agree	Strongly agree	Agree	Neutral	Disagree	Agree	Poor
Agree	Neutral	Agree	Neutral	Agree	Agree	Poor
Agree	Agree	Agree	Neutral	Disagree	Agree	Fair
Disagree	Agree	Strongly agree	Agree	Strongly agree	Disagree	Very poor
Neutral	Agree	Neutral	Agree	Disagree	Strongly disagree	Very poor
Agree	Agree	Strongly agree	Neutral	Agree	Agree	Good
Disagree	Neutral	Agree	Disagree	Agree	Strongly agree	Good
Agree	Agree	Neutral	Neutral	Disagree	Agree	Fair
Agree	Neutral	Agree	Disagree	Agree	Strongly agree	Good
Neutral	Agree	Agree	Strongly agree	Neutral	Strongly disagree	Poor
Neutral	Strongly agree	Strongly disagree	Strongly agree	Strongly agree	Neutral	Good
Strongly agree	Strongly agree	Disagree	Neutral	Neutral	Neutral	Good
Strongly agree	Strongly agree	Disagree	Agree	Agree	Agree	Good
Neutral	Agree	Disagree	Neutral	Agree	Strongly agree	Excellent
Agree	Agree	Strongly disagree	Agree	Agree	Neutral	Good
Neutral	Neutral	Disagree	Neutral	Agree	Agree	Poor
Strongly agre	Strongly agree	Disagree	Agree	Agree	Neutral	Poor

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Agree	Agree	Disagree	Neutral	Agree	Agree	Excellent
Agree	Strongly agree	Strongly disagree	Neutral	Neutral	Agree	Good
Strongly agree	Agree	Disagree	Neutral	Neutral	Neutral	Good
Strongly agree	Neutral	Disagree	Neutral	Neutral	Agree	Good
Agree	Agree	Strongly disagree	Neutral	Strongly agree	Strongly agree	Good
Neutral	Neutral	Disagree	Neutral	Strongly agree	Neutral	Good
Agree	Strongly agree	Disagree	Neutral	Neutral	Neutral	Good
Strongly agree	Neutral	Disagree	Neutral	Agree	Agree	Good
Agree	Agree	Disagree	Neutral	Neutral	Agree	Excellent
Strongly agree	Neutral	Strongly disagree	Agree	Strongly agree	Strongly agree	Excellent
Strongly agree	Neutral	Disagree	Agree	Neutral	Neutral	Good
Neutral	Strongly agree	Disagree	Strongly agree	Strongly agree	Agree	Good
Agree	Agree	Disagree	Neutral	Agree	Agree	Good
Agree	Strongly agree	Strongly disagree	Agree	Neutral	Agree	Good
Disagree	Agree	Agree	Neutral	Disagree	Agree	Fair
Disagree	Agree	Strongly agree	Neutral	Disagree	Strongly agree	Poor
Agree	Agree	Neutral	Agree	Agree	Disagree	Poor
Agree	Strongly agree	Strongly agree	Neutral	Agree	Agree	Good
Agree	Neutral	Agree	Disagree	Agree	Agree	Fair
Disagree	Agree	Agree	Neutral	Agree	Agree	Fair

Agree	Disagree	Neutral	Agree	Strongly agree	Neutral	Very poor
Neutral	Strongly agree	Agree	Disagree	Agree	Neutral	Fair
Neutral	Agree	Strongly agree	Neutral	Neutral	Agree	Excellent
Agree	Strongly agree	Agree	Neutral	Strongly agree	Strongly agree	Good
Neutral	Agree	Agree	Neutral	Agree	Agree	Fair
Agree	Agree	Agree	Neutral	Agree	Neutral	Fair
Agree	Neutral	Agree	Agree	Strongly agree	Disagree	Poor
Neutral	Agree	Strongly agree	Agree	Agree	Neutral	Good
Agree	Strongly agree	Neutral	Agree	Strongly agree	Neutral	Poor
Strongly agree	Strongly agree	Agree	Neutral	Agree	Disagree	Fair
Strongly agree	Agree	Neutral	Agree	Strongly agree	Agree	Good
Strongly agree	Agree	Agree	Neutral	Agree	Agree	Fair
Agree	Agree	Neutral	Disagree	Agree	Disagree	Poor
Neutral	Strongly agree	Agree	Disagree	Strongly agree	Neutral	Good
Strongly agree	Agree	Strongly agree	Strongly agree	Agree	Agree	Excellent
Agree	Neutral	Neutral	Agree	Strongly agree	Strongly agree	Fair
Disagree	Agree	Strongly agree	Agree	Strongly agree	Agree	Poor
Agree	Neutral	Agree	Disagree	Agree	Strongly agree	Good
Strongly agree	Neutral	Neutral	Agree	Agree	Strongly agree	Fair
Neutral	Strongly agree	Agree	Neutral	Strongly agree	Strongly agree	Good
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Neutral	Agree	Strongly agree	Neutral	Strongly agree	Strongly agree	Good
Agree	Agree	Neutral	Agree	Strongly agree	Strongly agree	Fair
Agree	Neutral	Strongly agree	Agree	Strongly agree	Strongly agree	Excellent
Agree	Strongly agree	Strongly agree	Neutral	Strongly agree	Strongly agree	Good
Agree	Strongly agree	Agree	Neutral	Strongly agree	Agree	Fair
Strongly agree	Strongly agree	Agree	Agree	Strongly agree	Agree	Fair
Neutral	Strongly agree	Agree	Neutral	Agree	Neutral	Poor
Strongly agree	Neutral	Strongly agree	Agree	Neutral	Neutral	Fair
Strongly agree	Strongly agree	Neutral	Disagree	Strongly agree	Agree	Good
Strongly agree	Strongly agree	Neutral	Strongly agree	Agree	Agree	Excellent
Disagree	Neutral	Strongly disagree	Neutral	Strongly disagree	Disagree	Very poor
Strongly agree	Neutral	Agree	Neutral	Agree	Strongly agree	Excellent
Agree	Neutral	Strongly agree	Agree	Strongly agree	Strongly agree	Excellent
Agree	Agree	Agree	Neutral	Agree	Agree	Poor
Neutral	Agree	Agree	Neutral	Agree	Agree	Poor
Agree	Disagree	Agree	Agree	Agree	Agree	Poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Disagree	Good

Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Fair
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Poor
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Fair
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
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Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Fair
Agree	Agree	Agree	Agree	Agree	Agree	Good
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Very poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Poor
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Very poor
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Very poor
Disagree	Disagree	Strongly disagree	Strongly disagree	Strongly disagree	Strongly disagree	Poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Strongly disagree	Disagree	Strongly disagree	Disagree	Disagree	Disagree	Fair
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Strongly agree	Strongly agree	Disagree	Good

Agree	Agree	Disagree	Agree	Agree	Disagree	Fair
Disagree	Disagree	Agree	Neutral	Agree	Disagree	Poor
Agree	Disagree	Disagree	Disagree	Disagree	Disagree	Poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
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Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Poor
Agree	Strongly agree	Agree	Agree	Agree	Disagree	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Strongly disagree	Poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Strongly agree	Agree	Agree	Agree	Agree	Agree	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Strongly agree	Strongly agree	Agree	Strongly agree	Agree	Neutral	Excellent
Agree	Agree	Agree	Agree	Agree	Agree	Good
Disagree	Agree	Agree	Disagree	Disagree	Disagree	Good
Neutral	Agree	Agree	Agree	Disagree	Disagree	Fair
Agree	Agree	Agree	Agree	Agree	Disagree	Good
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Neutral	Agree	Agree	Strongly agree	Disagree	Disagree	Poor

Agree	Agree	Agree	Agree	Agree	Agree	Good
Strongly agree	Strongly agree	Agree	Strongly agree	Agree	Agree	Good
Neutral	Disagree	Agree	Neutral	Disagree	Neutral	Fair
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Strongly agree	Strongly agree	Strongly agree	Disagree	Agree	Excellent
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Strongly agree	Agree	Agree	Agree	Agree	Good
Neutral	Agree	Agree	Agree	Agree	Strongly disagree	Fair
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Good
Agree	Agree	Strongly agree	Strongly agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Neutral	Good
Disagree	Disagree	Disagree	Disagree	Disagree	Disagree	Poor
Agree	Agree	Agree	Agree	Agree	Disagree	Good
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Agree	Agree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
Disagree	Neutral	Agree	Neutral	Disagree	Disagree	Poor
Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Agree	Strongly agree	Agree	Agree	Good
Neutral	Neutral	Neutral	Agree	Neutral	Agree	Fair
Disagree	Neutral	Agree	Neutral	Agree	Disagree	Good

Neutral	Agree	Agree	Agree	Neutral	Neutral	Good
Disagree	Disagree	Agree	Disagree	Disagree	Disagree	Poor
Agree	Agree	Agree	Strongly agree	Agree	Neutral	Good
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Agree	Agree	Excellent
Disagree	Disagree	Disagree	Agree	Disagree	Disagree	Fair
Agree	Strongly agree	Agree	Strongly agree	Agree	Agree	Excellent
Agree	Strongly agree	Strongly agree	Strongly agree	Neutral	Neutral	Excellent
Agree	Disagree	Disagree	Disagree	Disagree	Disagree	Good
Neutral	Agree	Agree	Agree	Agree	Neutral	Good
Disagree	Disagree	Agree	Agree	Neutral	Disagree	Good
Agree	Agree	Agree	Agree	Agree	Agree	Good
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Agree	Disagree	Agree	Agree	Disagree	Disagree	Good
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Agree	Agree	Agree	Agree	Agree	Agree	Good
Agree	Agree	Neutral	Agree	Agree	Neutral	Good
Strongly agree	Strongly agree	Agree	Agree	Disagree	Disagree	Fair
Neutral	Strongly agree	Agree	Strongly agree	Disagree	Neutral	Excellent
Strongly agree	Strongly agree	Strongly agree	Strongly agree	Disagree	Neutral	Good
Neutral	Agree	Agree	Strongly agree	Neutral	Neutral	Good

Agree	Strongly agree	Agree	Strongly agree	Neutral	Agree	Good
Disagree	Neutral	Neutral	Neutral	Disagree	Strongly disagree	Poor
Neutral	Agree	Agree	Neutral	Disagree	Disagree	Very poor
Agree	Agree	Agree	Strongly agree	Disagree	Disagree	Poor
Neutral	Agree	Agree	Agree	Disagree	Disagree	Good
Agree	Neutral	Agree	Agree	Neutral	Neutral	Good
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Agree	Strongly agree	Strongly agree	Agree	Disagree	Neutral	Good
Agree	Strongly agree	Strongly agree	Strongly agree	Agree	Agree	Excellent
Agree	Agree	Neutral	Agree	Disagree	Agree	Good
Disagree	Neutral	Agree	Agree	Agree	Disagree	Good
Agree	Strongly agree	Strongly agree	Strongly agree	Agree	Neutral	Good
Agree	Neutral	Strongly agree	Strongly agree	Agree	Neutral	Excellent
Neutral	Agree	Strongly agree	Agree	Agree	Neutral	Fair
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Neutral	Agree	Strongly agree	Strongly agree	Agree	Neutral	Good
Disagree	Neutral	Strongly agree	Neutral	Neutral	Disagree	Poor
Disagree	Neutral	Agree	Neutral	Agree	Neutral	Very poor
Disagree	Neutral	Agree	Neutral	Agree	Neutral	Poor
Neutral	Strongly agree	Strongly agree	Strongly agree	Strongly agree	Agree	Excellent
Neutral	Disagree	Agree	Neutral	Agree	Disagree	Poor
Neutral	Agree	Agree	Agree	Agree	Neutral	Fair
Agree	Strongly agree	Strongly agree	Agree	Strongly agree	Agree	Excellent

Disagree	Agree	Strongly agree	Strongly agree	Agree	Neutral	Fair