Policy Failure in Maintaining Road Safety in Bangladesh: A Qualitative Analysis of the Identified Causes and Suggested Solutions from Public Opinion Data

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Abstract: The study applies a qualitative approach and a network analysis on a set of text data, obtained from a set of knowledgeable persons in the area of road safety, to discover and understand the causes and remedies of the road safety problem in Bangladesh. Analyses of the text data show that the main causes of the road safety problem are, driving without licenses, competitive overtaking tendencies, violation of traffic rules, and poor law enforcement environment. The remedies are related to removal of these causes and building overall awareness among the road users. Government policies are important but often fail to improve the road safety situation because of the absence of social capital in the country. The study shows that the root cause of the problem lies in the lack of social capital and improvement in the road safety situation is not possible until progress in this front is not made.

Keywords: Road Safety; Policy Failure; Social Capital Qualitative Data

1. Introduction

Bangladesh is one of the most traffic accident-prone countries in the world where more than seven thousand persons lose their lives in around five thousand accidents on average each year. The numbers of persons injured in these accidents are more than double the death figure. A passengers' welfare platform, Bangladesh Jatri Kallyan Samity (Bangladesh Passengers' Welfare Association) closely monitors and publishes reports at regular intervals on various aspects of transport related accidents based on newspaper surveys in Bangladesh. According to a recently published report, it mentions that at least 7,221 people were killed and 15,466 injured in 5,514 road accidents reported across Bangladesh in 2018[1].

Estimates by government agencies are however very conservative. Based on police record, Accident Research Institute (ARI) of Bangladesh University of Engineering and Technology (BUET) estimates that at least 3,000 incidents of road accidents occurs every year on average, which kill around 2,700 people and injure about 2,400. The discrepancy indicates that many accidents, though published in newspapers, are not reported to or recorded by the police. The economic and social costs of these accidents are enormous. The estimated losses from these accidents amount to 40,000 crore taka[2]a year on average, which is about 2-3% of the country's GDP.Not only a large amount of human lives and physical capital are lost by these accidents, they also leave behind lingering emotional sufferings of the bereaved family members and injured persons.

As traffic accidents affect the wellbeing of people, the 3rd Sustainable Development Goals, adopted in 2015 by 202 member states of the United Nations, included it as a measure of achieving good health and wellbeing for people. Keeping this in mind, the government of Bangladesh has taken a series of measures to address the road safety problem, but no impact of these policies is visible in the ground. Of late, the prime minister of Bangladesh, Sheikh Hasina, during a cabinet meeting on June 25, 2018, issued a set of directives to ensure road safety and reinforce traffic discipline across the country (Antara, 2018). The measures included proper work hours for long-haul drivers, mandatory training for drivers and assistants in public transport services, service centers and resting rooms at regular intervals on the highways, and strict monitoring to ensure that everyone follows traffic rules. The government has passed a new traffic law called Road Transport Act, 2018 in the Parliament on September 19, 2018, which is in effect since November 1, 2019. The law replaces the old Motor Vehicle Ordinance, 1983 and contains more strict provisions for offensive behavior in the road.Driving without a license, for example, was punishable with 4 months jail with 400 takafine in the old law, but in the new law the offense is punishable with 6 months jail and 25000 taka fine.

The purpose of this paper is to analyze a collection of public opinion data on the road safety issue to discover major sources of unsafe roads and appropriate responses to deal with the problem. The qualitative research question addressed here is, why do accidents recur despite repeated policy measures taken by the government in Bangladesh? The collected data are qualitative text data and the study follows an inductive method of data analysis where outcome and conclusions are derived from the opinions expressed by knowledgeable persons in the society (a grounded theory approach). Unlike the deductive approach where hypotheses are tested following established theories in the literature, this approach is people centric and allows the data to speak. The analysis and conclusion, thus, follow a democratic bottom-up approach, instead of a top-down

approach. Literature review is of secondary importance here and its role is to keep the research on track (see, for example, Gioa, *et al.*2013).

The rest of the paper is developed as follows. Section 2 discusses the data source and the analytical tools used to derive the results. The data structure is discovered by analyzing the codes applied to the text data with a network analysis. Important sources of the road safety problem are identified and remedy suggested from the public opinion data in Section 3. The role of social capital in explaining the recurring road safety problem in the presence of government policy measures are examined with a simple process model in Section 4. The paper concludes with few remarks in Section 5.

2. Material and Methods

Consistent with the grounded theory approach, I rely here on the information-rich data source. Instead of randomly selecting subjects from mass population, attention is paid on subjects whose information is likely to meet the analytical need of the study. The selected sample is thus purposive and comes from a collection of opinions expressed in a roundtable meeting held in Dhaka on November 30, 2018 organized by the USAID, Dhaka Tribune, Democracy International, and three other sponsors. The data are publicly available as they are published in the daily newspaper Dhaka Tribune on October 19th, 2018[3].The text speeches of 17 knowledgeable persons on road safety issue that included opinions of 8 females and 9 males from government and private sectorshave been supplemented by various newspaper articles and editorial comments on the road safety issue.Data triangulation of this sort, mixing data from several sources, is likely to enhance the validity and reliability of the result. The data are qualitative in nature and have been stored as text files in a computer for analysis.

The data have been manually coded in RQDA, an open source qualitative data analysis software, for analysis. Coding is a critical part in extracting theme out of the raw qualitative data. As we read through the texts of a person's opinion, we apply our knowledge about the subject matter to attach a concept to a part of a sentence or a sentence or a whole paragraph so that a summary idea about the context of the text bloc is obtained. Throughout the coding procedure, many sentences get the same coding and similarly many codes are associated with the same text bloc. The process of multiple coding helps discover the data structure from the raw texts. Description of the codes and their aggregation are provided in Table 1 in Section 4.1.

The coding and categorization done above is manual, not automatic or computer generated. However, advances in computer based text data analysis permits us to generate theme or topics from a corpus of texts. To understand the number of topics the respondents were discussing with in the roundtable, a set of two to five topics were

given as inputs in a Latent Dirichlet Allocation (LDA) based topic modeling software. The model diagnostic results on log-likelihood, residuals, lower bound, and semantic coherence test are given in Figure 1 in the Appendix. When five topics are selected, the model seems to have lower residuals, high likelihood, minimum lower bound, and moderate semantic coherence. So, five topics can be taken as reasonable that the respondents were engaged with in their discussion.

The content of the topics in terms of high frequency words and the hierarchical clustering of the topics based on their Euclidean distances are shown below in Figure 1 and Figure 2 respectively. Topic 4 is concerned about the overall road safety situation by citing such terms as accidents, road, transportation, vehicle, and safety. Topic 2 is concerned about the remedy of the road safety problem by mentioning terms like discipline, driving, sector, driver, and road. Topic 1 is concerned about the effects of the road safety problem, by giving more probability to words like number, death, last, year, and road. Some words occur across topics, because the LDA algorithm creates fuzzy classes, instead of distinct classes. This is why road and driver are seen to occur across topics. The closeness of the topics are indicated by the vertical distances of the topics in the dendogram of Figure 2. So, topic 1 and 2 are closely related while topic 4 is quite different from them. A comparison of topic 4 with topic 2 is provided in Figure 3 where words like road and accident get prominence in topic 2 while law and city dominate in topic 4. Word like highway is important in both topics.
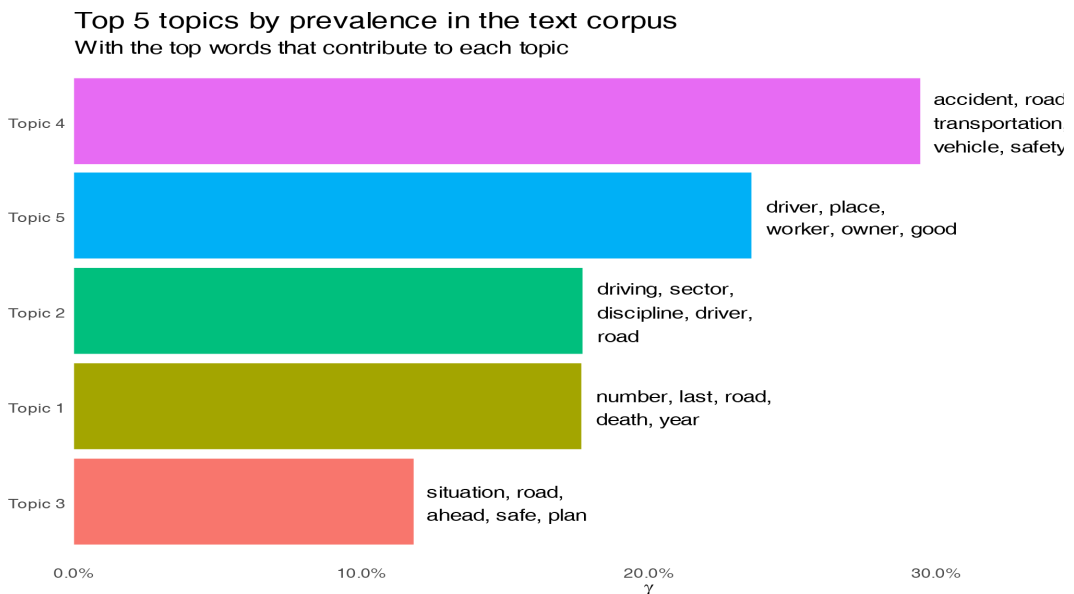

Figure 1: Top 5 topics by prevalence in the text corpus with the top words that contribute to each topic
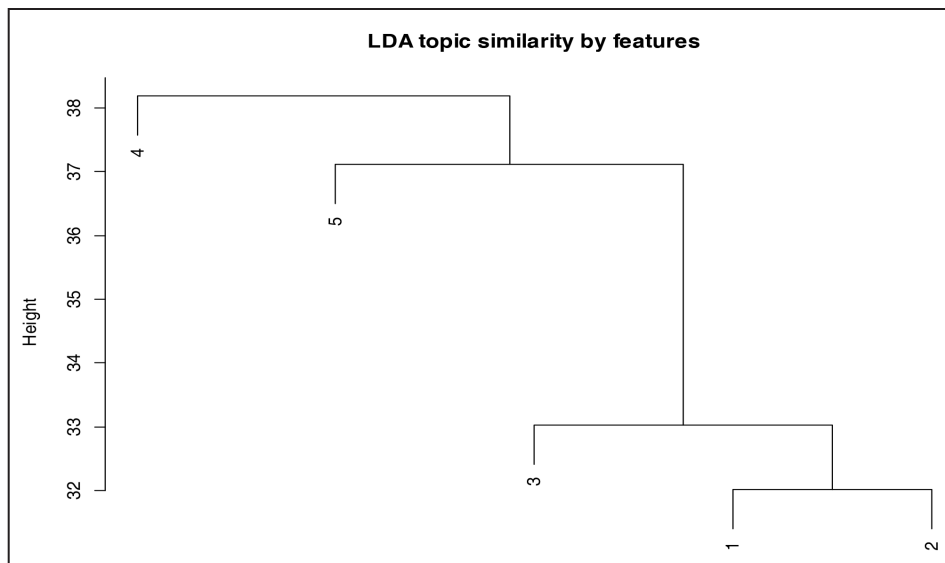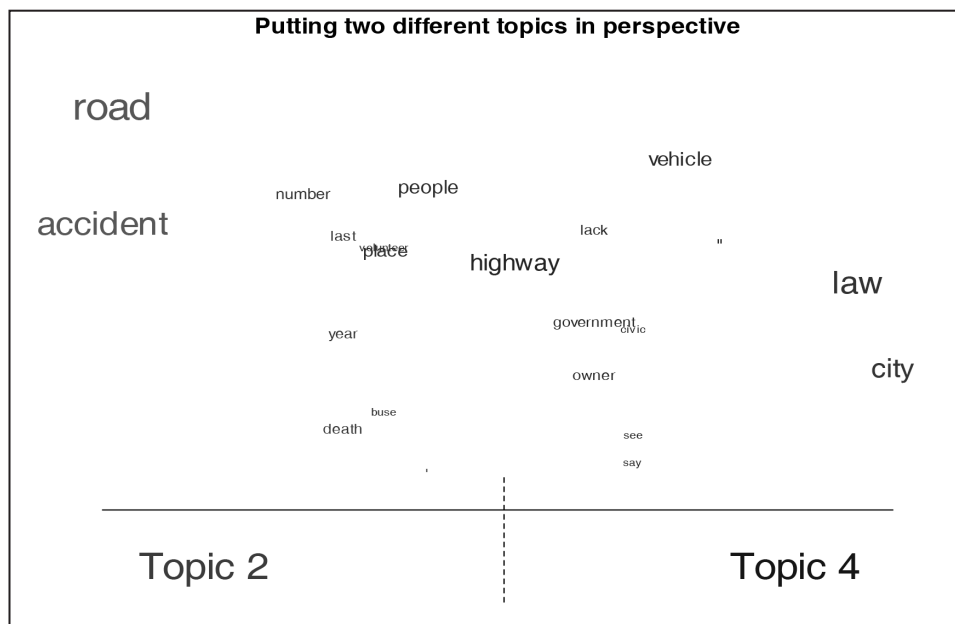
Figure 2: Hierarchical clustering of the 5 topics

Figure 3: Comparison of topic 2 with topic 4

3. Theoretical Structure

As indicated in the introduction section, the study is based on qualitative data and follows the grounded theory approach where results and conclusions are drawn from

the analysis of the text data. Developing new theories from data derived in a particular social context, instead of testing existing theories, gets priority here. The nature of analysis here is exploratory and contributes to theory building. The qualitative approach we follow contrasts with pure quantitative approach where hypotheses are formed and tested with repeated measure survey or experimental data following some established theories. We go the other way round in this qualitative enquiry, starting from data and moving toward abstraction and theory.

The basics of a data driven qualitative research model are portrayed in Figure 4 below. The unstructured qualitative data collected from the field are shown at the left hand side of the figure. To analyze the qualitative data corpus, the first step is to assign codes to the relevant segments of the data. The codes are then categorized based on their proximity and differences. The major categories are then compared with each other in various ways for generating themes and concepts from where we provide
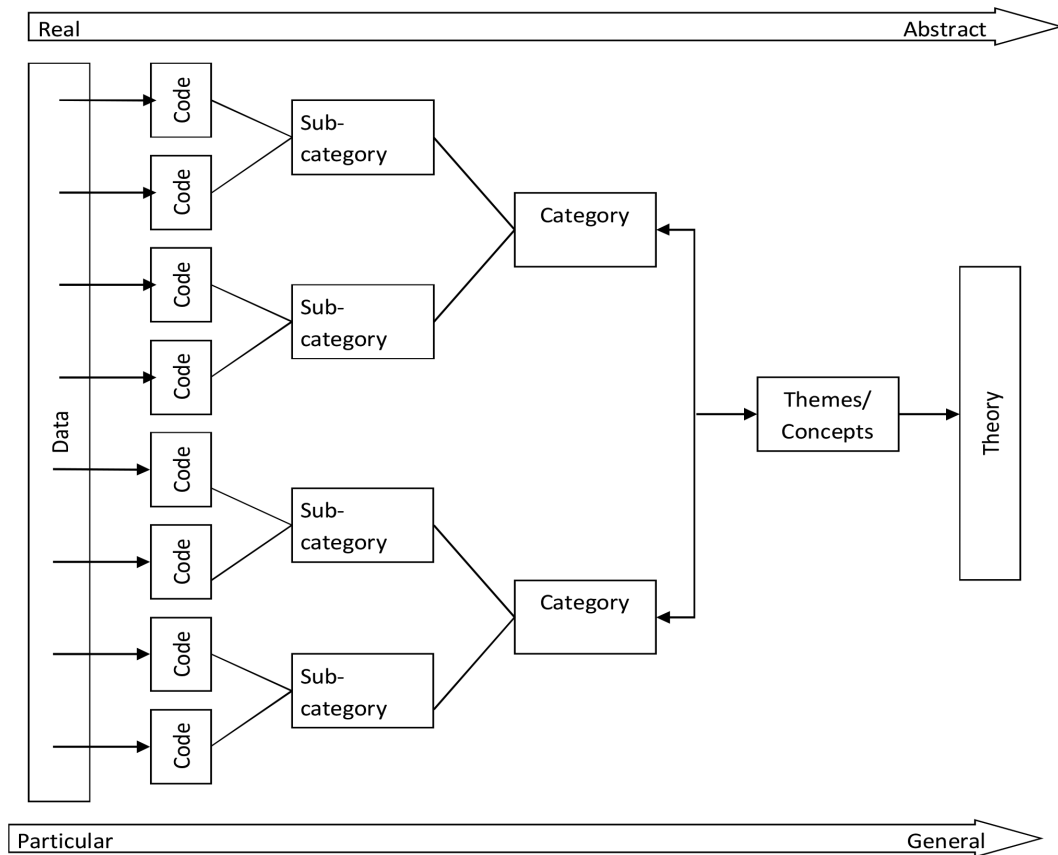

Figure 4: The Data to Theory Model

an explanation of the phenomenon of interest by developing a grounded theory or at least propose a key assertion about the research problem. The basics of grounded theory approach are illustrated in Glaser and Strauss (1967) and its later refinement is available in Charmaz (2014).

The data exploration journey starts with the complex reality in the ground and the initial descriptions are particularly related to the data, opinions in plain language of the respondents in our case. As we progress toward building theory, our analysis becomes more abstract and descriptions are provided in more general terms, directed at the academic and research community. It should be noted that theory is a kind of simplification of the complex reality, and many intricacies of the real world are avoided with assumptions. This is why the theory box at the right hand side of the diagram is smaller than the left hand side grounded data box.

4.   Results and Discussions

The results derived by applying the method discussed in the previous section, and their implications are discussed in this section under four sub-sections. First, the data structure that emerges from the network analysis of the codes is presented. Second, based on the data structure causes and remedies of the road safety problem are analyzed in the sub-sections that follow. Finally, a process model is identified to explain the persistence of the road safety problem in the presence of government policies.

4.1. Discovering the data structure

After scanning through the opinion texts and other documents, a total of 42codes have been identified, and these codes broadly fall under three categories - causes, consequences, and remedies of the road safety problem. To discover a structure of the codes we treat each codes as a node and present them in a network diagram, Figure 5. Descriptions of the nodes are given in Table 1. The first seventeen codes (code 1 to code 17) represent the respondents and the remaining nodes correspond to the opinions of these respondents. Each opinion provider is connected by some paths with their comments or opinion nodes. Some opinion nodes are shared by more than one discussants and these are the shared concern about the road safety problem. Moreover, some paths are thicker than others, implying that a discussant mentions them several times in his or her opinion. Opinions are of three types: causes, consequences, and response to the road safety problem. Nodes categorizes are shown in the third column of Table 1.
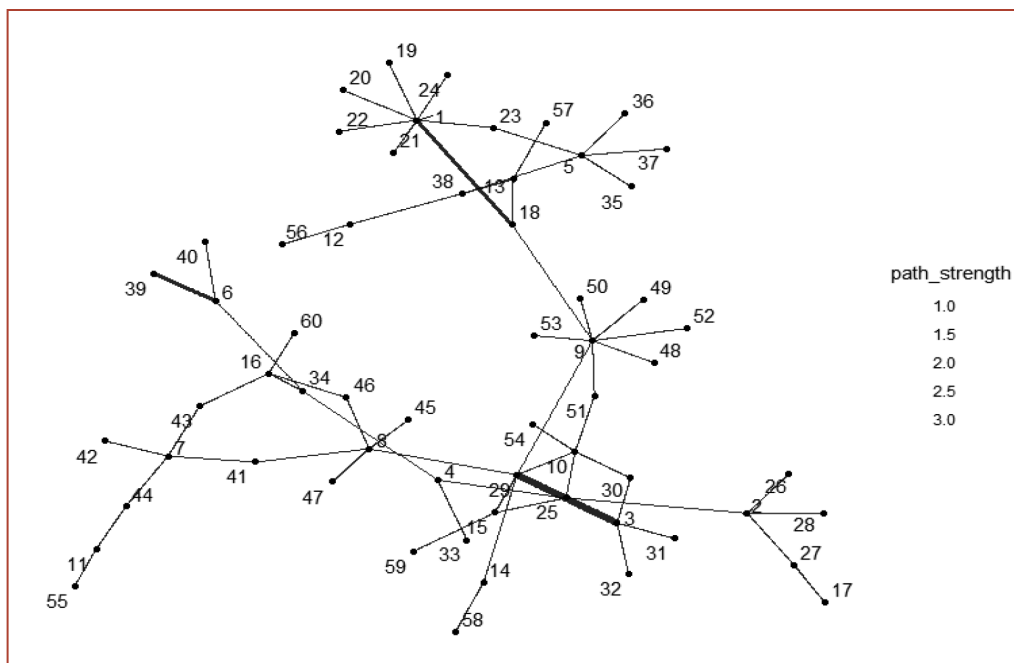
Figure 5: Structure of the Opinion on the Road Safety Problem

Notes: Numbers 1-17 represent respondent IDs and are anonymous. The other numbers, 18-59 are opinion code IDs and their definitions are listed in Table 1. The list of connections between nodes and the weight of the paths are given in Table A2 in the Appendix.

Table 1: Description of the Nodes in Figure 5

Node	Description	Category
1-17	Opinion provider	Respondent
18	Pass tough law	Remedy
19	Financial loss	Effect
20	Low quality insurance	Cause
21	Transport worker strike	Cause
22	No driving license	Cause
23	Unfit vehicles	Cause
24	Repair vehicles	Remedy
25	Student movement	Effect
26	Vote factor	Effect
27	Political response	Remedy
28	Govt response	Remedy

Node	Description	Category
29	Raise awareness	Remedy
30	Training of drivers and workers	Remedy
31	Law enforcement	Remedy
32	Govt employees should not be transport worker leaders	Remedy
33	Reckless driving	Cause
34	Attention to large vehicles	Remedy
35	Empower city corporation	Remedy
36	Bring all relevant org under same umbrella	Remedy
37	Construct service road outside city highways	Remedy
38	Enforce law	Remedy
39	Education and training for accident investigators	Remedy
40	Make transport sector job prestigious	Remedy
41	Monthly pay instead of contractual pay for drivers and workers	Remedy
42	Dope test for drivers	Remedy
43	Identity risky points on roads	Remedy
44	Create alternative to road transport	Remedy
45	Bring discipline	Remedy
46	Competition among drivers	Cause
47	Stop extortion	Remedy
48	Remove slow moving vehicles from highways	Remedy
49	Stop illegal parking	Remedy
50	Update qualification test for driving license	Remedy
51	Increase harmony	Remedy
52	Insurance	Remedy
53	Clear footpath	Remedy
54	Limit speed	Remedy
55	Human loss	Effect
56	Address problem holistically	Remedy
57	Civic pride	Remedy
58	Collective value deteriorating	Cause
59	Consistency	Remedy
60	Emergency response	Effect

Figure 5 shows that, the respondent in node 3 stresses more on opinion node 29, which is increasing awareness, by mentioning it three times in his response. This opinion node is also shared by respondents 6, 9, 10, 14 and 15. Thus, raising awareness appears to be a crucial element in finding the road safety solution. The second most important elements is "pass tough law" (node 18) which is mentioned two times by respondent 1, one time by respondent 9, and one time by respondent 13. Some other important factors that are shared by at least two respondents are "create alternative to road transport" (node 44), "identify risky points on the roads" (node 43), "pay attention to large vehicles" (node 34), "remove unfit vehicles" (node 23), and "enforce law" (node 38).

Two areas that the respondents are immersed with in their discussions on the road safety topic are the casus and remedies of the road safety problem. These two areas are highly interlinked and removing causes implies the solution. Some important elements of these two aspects of the road safety problem that emerge from the discussions of the roundtable participants are given below.

4.2. *Causes of the Road Safety Problem*

The discussants identify 7 causes of the road safety problem which can be related to the sloppy administration and the resulting uncompliant behavior on the part of the road users. Driving without licenses, running unfit vehicles, failure to prevent driving on the wrong side of the road or violation of traffic signals, and violations of other road rules result from the poor law enforcement environment. A vicious circle between the weak law enforcement environment and the persistence of chaotic road is created, from where corrupt staffs involved in law implementation and the self-interested road users are benefitted. On the part of the law enforcers, benefits are accrued in the form of getting speed money, shirking duty or avoiding the pain of maintaining road rules, and on the part of the road users benefits may take the form of saving extra expenditure on keeping vehicles fit, driving without proper documents, and shortening of travel time to reach destination by violating traffic rules.

The sufferers of this vicious circle are the general public who experience chaotic traffics on the roads and risk lives. In this case, the beneficiaries are extracting rent on scarce public resources and the sufferers are the public at large. As the numbers of losers are very large, the amount of loss is likely to exceed the gain, resulting in a deadweight loss for the society, as happens in a market with monopoly power. Though the number of public, who suffer from the system, is very large often fail to organize to thwart the malpractices of the beneficiaries. The situation can be explained by the Olson's thesis that political activity on behalf of a group of people is a public good and when

individual gains or losses are small then actions are not taken though the aggregate gain is very large (Olson, 1965).

Accidents often occur because of untrained driving and dearth of institutions that provide driving training. Most of the driving training programs in Bangladesh take place on private initiatives. After a person feels confident in driving, he or she appears in a driving test organized by the Bangladesh Road Transport Authority (BRTA). The test is very rudimentary – a written test and an oral test involving road rules, and a practical test where the candidate goes through some flags and returns back to the starting point without touching the flags. There are allegations that many examinees are showed to have passed the driving test, in spite of their poor performance, if they appear the test through some channels that are linked with corrupt officials[4]. As one of our opinion provider comments, "The way one can get driving license in Bangladesh is found nowhere in the world". Raising the standard of the driving test may produce more efficient drivers, but the problem is that the number of vehicles in the country is far greater than the number drivers with driving licenses. So, raising standards will intensify the driver shortage problem and encourage further corruption.

A major cause of accidents is the tendency to engage in overtaking competition among the drivers, which arises because of the nature of contracts between transport owners and transport workers. The current practice in Bangladesh is such that transport workers rent vehicles from owners for a fixed period of time with a given amount of money. So, it is in the interest of the hiring party to maximize the number of trips within that period. This practice not only increases the chances of accidents, but also deteriorates the conditions of the vehicles. Introduction of the salary system for the drivers and other transport workers may solve the unhealthy practices among the drivers in the street. Moreover, social status of salaried workers is better than casual or temporary workers in the context of Bangladesh, which will encourage educated person to choose driving as a profession. If this is the case then, it will be much easier to build awareness among the educated workers.

4.3. Suggested Remedies

In line with the causes of the road safety problem, solutions suggested by the discussants put emphasis on effective administration and overall awareness of the road users. Three of the discussants talk about the tough laws, one of whom mentions it twice. One of the discussants from the government sector opines that passing of new stricter laws are difficult as the process involves many meetings and consensus among the stakeholders. He mentions that passing of a new strict law in this regard required more than 200 meeting. Moreover, existence of laws alone cannot ensure road safety. What matters,

are the respect for the law and its implementation. A discussant points out in her discussion that immediately after an accident, the perpetrator is not handed over to the law enforcing agency. Instead, many innocent vehicles along with the vehicle causing the accident are vandalized as a sign of protest. Discussants with IDs 3, 12, and 13 in Figure 5 put emphasis on the implementation issue along with the passing of stricter laws. One of them also suggests holding law enforcers responsible for not properly implementing laws.

Some other solutions that came out of the discussions are construction of new less hazardous roads, making existing roads less hazardous, removing unfit and slow moving vehicles from highways where speed mismatch often causes accidents. Implementation of these suggestions is however a challenging job for Bangladesh where most of the people are in low-income status and depend heavily on these vehicles providing low cost transport services. Transport services are already in severe shortage and removal of these vehicles will further deteriorate the situation. Government needs to provide or subsidize transport services, should government wishes to make progress in this direction.

A more attractive suggestion made by some discussants is the construction of alternate transportation network like Metrorail and waterways to reduce pressure on congested roads, This option is becoming more relevant for Bangladesh as the number of vehicles here is increasing at a more rapid rate than the capacity of roads each year. The number of registered motor vehicles stands at 1,255,402 as of April 2018, increasing from 303,215 in 2003 - a fourfold increase in the past 15 years (about 27% increase on average per year), according to the BRTA's records. The total length of road in the country, on the other hand, has increased to 21,569 km as of February 2019 from 20,948 km in 2010, representing only a 3% percent increase over the past 9 years (Bangladesh Economic Review, 2019). This means that the increase in traffic flow has far exceeded the increase in road capacity in recent years.

4.4. A Simple Process Model Explaining the Persistence of the Road Safety Problem

Given the public opinion about the causes of the road safety problem, the suggested solutions and a number of government initiatives, the problem persists. So, the major challenge before us is to find out the process that is contributing to the sustenance of the problem, and suggest ways to escape from the trap. We reason that absence of social capital is at the heart of problem and the lack of this important element frustrates remedial measures. Social capital in this context, as defined by Todaro and Smith (2015), means the productive value of a set of institutions and norms, including group

trust, expected cooperative behavior with predictable punishment for deviations, and a shared history of successful collective action that raises expectation for participation in future cooperative behavior. Various elements of the road safety problems listed in Table 1 can be linked with the absence or weaknesses of one or more components of social capital.

For convenience, the six components of social capital provided in the definition of Todaro and Smith can be thought of contained in two broad classes. First, 'set of institutions' and 'predictable punishment for deviations' are related to the broader governance factor. Remedial measures indicated by code 18, 24, 30, 33, and 34 (see Table 1 for code description) are not working because of weaknesses or credibility in the governance sphere. Second, 'norms and values', 'group trust', 'history of cooperative behavior', and 'expected cooperative behavior' belongs to innate tendency of persons. Reckless driving, competition among drivers, awareness, and many other sources of the road safety problem are associated with this second set of factors. The mapping between the codes (issues raised by the opinion providers) and various components of social capital is shown in Table 2. The assignment of various codes to various elements of social capital is of course not discrete. Rather, some codes can sit across more than one element of social capital. Passing of tough law (code 18), for example, can belong to both the set of institutions and punishment for deviations items.

Table 2: Mapping between the codes and the components of social capital

Components of Social Capital		Issues Raised by the Participants (code)
Governance Related	Set of institutions	Pass tough law (18), training drivers (30), enforce law (38), education and training (39), dope test (42), monthly pay (41), insurance (52)
	Predictable punishment for deviations	Stop illegal parking (49), action against violating speed limit (54), unfit vehicle (23),
Innate Tendency Related	Norms and values	Raise awareness (29), discourage reckless driving (33)
	Group trust	Increase harmony(51), civic pride(57),
	History of cooperative behavior	Collective value deteriorating(58),
	Expected cooperative behavior	Address problem holistically(56),

The government often takes renewed policy measures to make roads safer whenever a road accident takes place causing casualty for some members from an influential group in the society who are capable of staging a severe protest. The problem of recurring road safety crisis can be understood in terms of the absence of social capital as shown in Figure 6 with a simple flowchart.
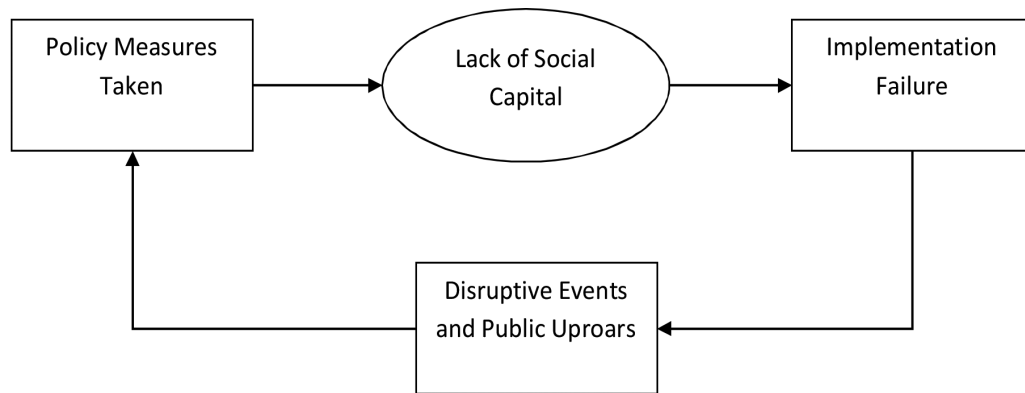
Figure 6: The Process of Sustained Road Safety Problem

Road accidents occur as a regular event in the country and published in the news and people accept it as an ordinary matter of life. Occasionally, some accidents become disruptive and attract public attention when the casualty occurs to a member of a well-organized body, such as the student community, due to reckless driving. One such event took place on July 29, 2018,when two students of Kurmitola's Shaheed Ramiz Uddin Cantonment School and College were killed by a Jabal-e-Noor Paribahan bus that crashed into them on a sidewalk.Many students took to the streets, demanding justice for the victims. The agitation got momentum and quickly spread all over the country. The government was forced to launch special measures in an effort to bring discipline on the streets and the transport sector.Though the effort workedfor few days, things rolled back on to the same indiscipline that existed before.

Since awareness among the road users and law enforcers, which is a part of the social capital, does not change after the disruptive events, the process model shown in Figure 6 remains effective. In 2017, the year before the disruptive event took place, the number of road accidents was 4,979 where 7,397 persons died and 16,193 persons injured. In 2018 when massive public protest demanding safe road took place, the number of accidents increased to 5,514 which resulted in 7,221 deaths and 15,466 injuries (Report of the Passenger Welfare Association, 2019). The data supports the process model in Figure 6.

A distinctive feature of social capital is that, unlike physical or financial capital, social capital cannot be borrowed from another country or build within a short period of time, since it involves changes in value, culture, and norm of the society. So, long term measures are essential to make the road safety program successful. Several measures might be useful in this respect. First, the government might consider introducing road safety rules in the curriculum of the primary education. However, proper content in

the book or learning about road safety rules to pass exams is not enough. The main purpose of leaning rules should be to put them into practice. One option might be for primary school authorities to communicate with the traffic polices in the city areas to demonstrate the practicing of the road safety rules during the traffic weeks that are observed throughout the country each year.

Second, establishing a hotline to receive complaints about the violation of rode rules and taking immediate action will encourage socially conscious people to report wrong doings in the road. The rule violating events or incidents can be supported by pictures taken by the mobile phones, CCTV, or other devices. If some people see response from the higher authority, other people will be encouraged to lodge complain against malpractices in roads. Proper response will also discourage wrongdoers or prospective wrongdoers to be apprehensive of punishment in the future. Awareness might creep-in in this way in the society. Third, technology might be used to monitor road safety compliance. The government has already put close circuit cameras at many important places. The authority can monitor online the offending persons and traffic polices not obeying their duties. With evidence, then the higher authority can impose penalty on the persons responsible for making the roads unsafe.

The ultimate goal of the above policies is to create a culture of safety practices while using roads so that road rules are followed from the sub-conscious mind instead of fear of punishment. Once the vicious circle between unsafe road rules and ineffective policy measures are overcome, the need for corrective measures will gradually diminish and the dividend of social capital will become apparent.

5.   Concluding Remarks

Road accident is a common disturbing phenomenon in Bangladesh that takes a heavy toll in physical, monetary, and emotional terms. Why do such problems occur and how to deal with them are analyzed in this paper with qualitative opinion data obtained from a group of knowledgeable persons in this area. The result based on a network analysis shows that lack of awareness, untrained drivers, and competitive overtaking tendencies among drivers, are the main causes of the road safety problem in Bangladesh. The solution resides in the removal of these problems. Moreover, in some cases, the problems may be turned into opportunities. Since unemployment and shortage of trained drive coexist, subsidized driving training program by the government can improve the road safety situation and reduce unemployment problem at the same time.

Finally, the perpetuity of the road safety problem is explained in terms of a simple process model where formation of social capital emerge as a key player in solving the problem. Since elements of social capital are behavioral and it takes time to change

behavior, long term measures should accompany short term measures for making policy measures effective.

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Notes

1. Some recent road accident related data are provided in Table A1 in the appendix.

2. Taka is the local currency of Bangladesh and exchanged for 1/86 U.S. dollars in 2018 in the foreign exchange market.

3. The texts of the speeches were accessed on November 25, 2019 from https://www.dhakatribune.com/special-supplement/2018/10/19/road-safety-in-bangladesh-causes-and-remedies.

4   See the YouTube report of the Boishaki TV at https://www.youtube.com/watch?v=zMeBWH4-LPI (accessed on 23 February 2020), and the Dhaka Tribune report at https://www.dhakatribune.com/bangladesh/corruption/2018/08/07/brokers-milk-the-crowd-at-brta-offer-fail-proof-licences on the issue of corruption in issuing driving licenses.

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Appendix

Table A1: Road Accident Statistics

Year	No of Accidents	Death (persons)	Injuries (persons)
2015	6,581	8,642	21,855
2016	4,312	6,055	15,914
2017	4,979	7,397	16,193
2018	5,514	7,221	15,466

Source: Bangladesh Jatri Kalyan Samity (2019), Summary result published in the last page of the Daily Azadi on 22/10/2019

Note: The results are based the reports published in newspapers and since many accident are not published in the newspaper, the estimates are not exaggerated.

Table A2: Path List

from	to	weight
1	22	1
1	21	1
1	23	1
1	20	1
1	19	1
1	18	2
1	24	1
2	25	1
2	26	1
2	28	1
2	27	1
3	32	1
3	31	1
3	29	3
3	30	1
4	33	1
4	25	1
4	34	1
5	23	1
5	36	1
5	37	1
5	35	1
5	38	1

6	34	1
6	39	2
6	40	1
7	44	1
7	42	1
7	43	1
7	41	1
8	46	1
8	45	1
8	41	1
8	29	1
8	47	1
9	53	1
9	51	1
9	52	1
9	18	1
9	29	1
9	48	1
9	49	1
9	50	1
10	25	1
10	51	1
10	54	1
10	29	1

10	30	1
11	55	1
11	44	1
12	56	1
12	38	1
13	57	1
13	38	1
13	18	1
14	58	1
14	29	1
15	25	1
15	59	1
15	29	1
16	46	1
16	60	1
16	34	1
16	43	1
17	27	1

The path list shows, who has pointed out what about the road safety issue. The weight represents the frequency of the factors mentioned by the respondents.
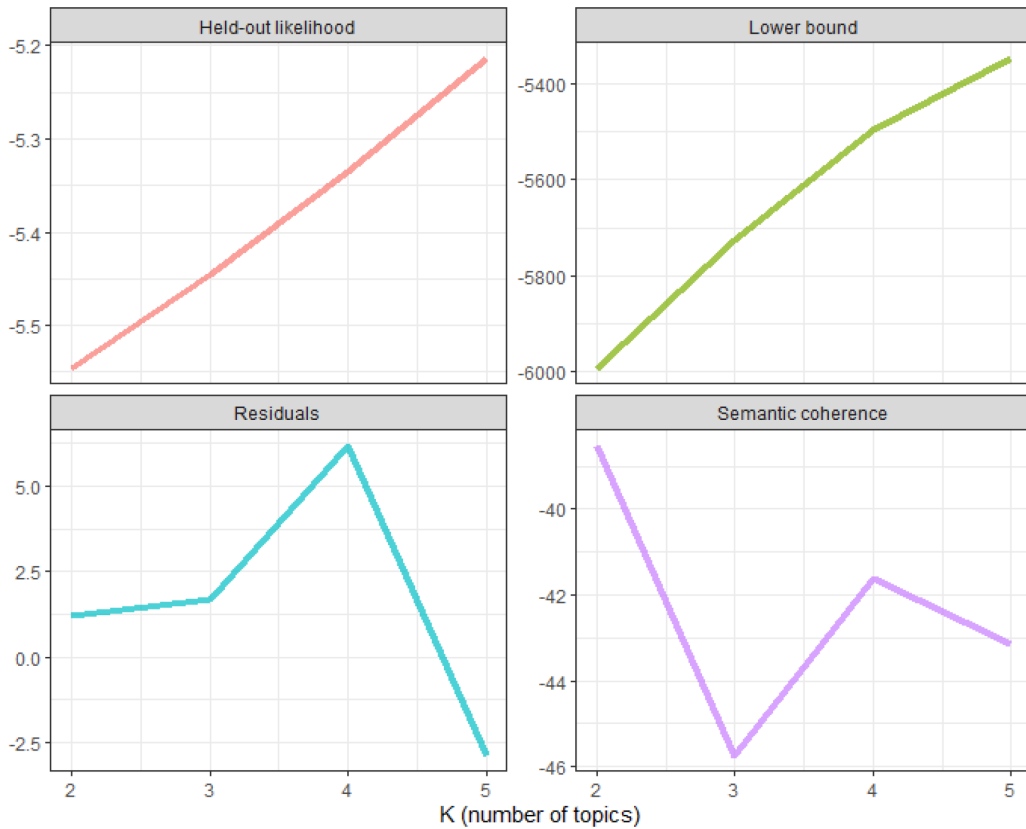

Figure A1: Diagnostic tests for topic selection

Table 2: Opinion Providers to Opinion Node Links and Their Weights

from	to	weight
1	22	1
1	21	1
1	23	1
1	20	1
1	19	1
1	18	2
1	24	1
2	25	1
2	26	1
2	28	1
2	27	1
3	32	1
3	31	1
3	29	3
3	30	1
4	33	1
4	25	1
4	34	1
5	23	1
5	36	1
5	37	1
5	35	1

from	to	weight
5	38	1
6	34	1
6	39	2
6	40	1
7	44	1
7	42	1
7	43	1
7	41	1
8	46	1
8	45	1
8	41	1
8	29	1
8	47	1
9	53	1
9	51	1
9	52	1
9	18	1
9	29	1
9	48	1
9	49	1
9	50	1
10	25	1

from	to	weight
10	51	1
10	54	1
10	29	1
10	30	1
11	55	1
11	44	1
12	56	1
12	38	1
13	57	1
13	38	1
13	18	1
14	58	1
14	29	1
15	25	1
15	59	1
15	29	1
16	46	1
16	60	1
16	34	1
16	43	1
17	27	1