

Improvement of Classification of Road Problems for Easy-to-use Mobile Reporting Application

Woo Hoon Jeon¹, Won Bum Cho^{1,2}, InChul Yang^{1,3}

¹ Korea Institute of Civil Engineering and Building Technology, KOREA

² Ph.D. Student, Department of Transportation Engineering, University of Seoul, KOREA

(* Corresponding Author)

³ Professor, Korea University of Science and Technology (UST), KOREA

Abstract

Cheok Cheok Service, which is the road management system encouraging the people to take part in the service, is intended to provide the assistance in dealing with the inconvenience to the road users in timely manner, thereby ensuring the safety and comfort for the users. This study makes commitment to improving existing road manager-centered classification system to road user-centered system and the outcome from the improvement includes; First, in existing system, the reports were concentrated on 3 categories including 'Others', as many as 93.1%, among 6 types. Particularly, Others which was designed to accommodate ambiguous situation only accounted for 34.8% which is considered too high. And 2 of remaining 5 types (65.2%) excluding Others accounted for 58.3% and remaining 3 types accounted for only 6.9%. Second, Others according to proposed classification system was 17.4% and 77.5% of remaining 82.6% was evenly distributed to 3 types among 4. Proposed system makes commitment to reducing the confusion of the complainants, simplifying the decision-making process for timely report as well as simplifying the process for the road management agency in dealing with the complaints so as to enhance the overall service quality.

Keywords: Cheok Cheok Service, Classification System, Road Manager, Road User, Smart Phone App.

1. Introduction

1.1 Background and Objective of Study

Frequent inclement weather and deteriorated road are the major cause of road traffic accidents in these days. Pothole which is usually made by damage to road surface is one of the good examples. Pothole easily

appears a simple defect which however shall be considered a severe road damage that may lead to fatal accident. In fact, the accident by pothole in 2008 totaled 209 which was then increased by 5 times to 1,051 in 2013. Besides pothole, seriousness of traffic accident due to poor maintenance resulting from rockslide/landslide, freezing road surface and lack of safety device has been increasingly imposing a huge burden on road management agency, coupled with increased judgment on compensation against the government. The road management agency, without question, shall build a complete road management system to provide a safe road environment. But the manpower for road management is far behind the road that has been increased faster than ever, causing the difficulties with effective road management in timely manner. For such reasons, most of road management agencies have established and managed the complaint center and the Ministry of Land, Infrastructure and Transport has a report system for complaint on road by phone (080-0482-000) and Korea Expressway Corp has situation report system and MOPAS has a complaint center. In addition, municipal offices have own report systems, but the current system has a number of problems to be improved. First, phone number of each agency is not unified, but all different. Second, the road users have difficulty in identifying the responsible agency for the road which the user is about the complaint. And third, it's not easy to know the process on how the problem is solved.

To deal with such problem, a Cheok Cheok Service developed by MOLIT is in operation to provide the people with easy report and solution service within 24 hours (hereinafter called "Cheok Cheok Service") Cheok Cheok Service is intended to provide the people with the system for report on inconvenience in using the road, anytime and anywhere, using a smart phone app. Among the subjects to report are damage to road pavement, falling-rocks and other

inconveniences while using the road and a ready-to-go repair team is mobilized to deal with the report and the result is notified to the informant within 24 hours.

The differences with the existing system are direct report by the road user in a way of transmitting the photo or image of the scene through the app and the direct verbal report to road management agency after searching the phone number using GPS that makes possible easy and quick report for user's convenience. Furthermore, ready-to-go repair teams are under the direct management of KEC's 52 regional offices and 18 regional construction & management administration's offices. Thanks to such efforts, the informant is notified of the result within 24 hours, which helps smooth communication between the road users and road management agencies.

The type of complaint through Cheok Cheok Service is classified into 6 categories, which include road damage indicating road surface condition, ditch indicating road drainage, road safety facility indicating road and traffic safety facilities, snow removal indicating road freezing and rockslide and landslide indicating falling-stone and soil and others. Reporting type is very important element to both the reporter and road management agency. Clear and specific report process leads the reporter to easily select the reporting type which is safe and convenient for the reporter as well as the road management agency who can identify the situation easily when receiving the report. Then viewing the reporting type selected by the reporter for last year (Apr 2014~ Mar 2015), "others" accounted for 35% which indicates the reporting type still remains not specific and the reporter had no other choice than "others" And it took the time for the reporter to select the reporting type among other 5 types, causing inconvenience with the report as well as the error with the site location due to time delay. Should the "others" be reduced to 20% or less thanks to more specific classification of reporting type, it would surely enhance the convenience and accuracy of the report.

This study thus is intended to propose the measure to reclassify the reporting types in Cheok Cheok Service. To that end, the error in selecting the reporting types from the previous data are sorted out and optimal reporting types are determined from the reporter's viewpoint.

Re-categorized reporting types proposed in this study would possibly reduce the time for the reporter in choosing the type and reduced "others" would help simplify the analysis by the road management agency.

1.2 Methodology of the study

This study is aimed at reestablishing the reporting type in Cheok Cheok Service, the road complaint system. 6 reporting types in existing Cheok Cheok Service are analyzed to review the selective error with a keyword analysis, thereby recommending the new concept of the reporting types.

2. Review of existing similar systems

One of the domestic systems similar to Cheok Cheok Service is Living Environment Complaint Report mobile app. Service (LECRS) in operation under the management of the Ministry of Government Administration and Home Affairs (MOGAHA) to hear the complaint about inconvenience in living environment. Thus reporting types are comprehensively classified into 10 categories including illegal advertisement, road damage, road sign, illegal trash dumping and trouble with road lamp and traffic signal.

Table 1: Classification of reporting types in LECRS (MOGAHA)

Division	Contents
Illegal advertisement	- Banner, standing signboard, poster, flyer
Road damage, Public facilities	- Road/sidewalk damage, traffic facilities / security CCTV
Road sign/ building number / index number	- Damage or wrong road sign/ building number / index number
Illegal trash dumping	- Illegal trash dumping, throwing cigarette butt
Road lamp / traffic signal	- Breakdown of road lamp/ traffic signal, street trees
Environmental contamination	- Unauthorized discharge of wastewater, odor, illegal burning and waste dumping

Bike	- Damage to bike stand, bike path and other inconvenience
Energy overspending	- Violation of energy law (commercial facilities)
Facilities harmful to juveniles near school zone	- Adult entertainment venue, sales of liquor /cigarette to juveniles
Illegal parking	- Illegal parking or parking in a handicap zone
Other inconveniences	- unsanitary foodstuff, dangerous facilities

One of the good examples in other countries is '1746(1-Rio)' service implemented in Rio, Brazil. '1746(1-Rio)' is the emergency report system on road using a smart phone app. According to the survey, this detection and process system was designed to improve the existing system taking 3 to 4 hours only to designate the responsible person, making use of the app. Consequently, the complaints claimed through '1746(1-Rio)' service accounted for 85% of the total and DB on what and where the problem occurred was developed and the measures to deal with such problems have been established. Reporting types are classified into 9 categories including mosquito aedes aegypti-related Zika virus, illegal act by taxi or bus, pothole and trash collection.

Table 2 : 1746(1-Rio) Complaint system (Brazil)

Division	Contents
Control of Aedes Aegypti	- Mosquito aedes aegypti
Irregularities in Taxis, Buses and Vans	- Illegal act by taxi, bus and truck
Potholes	- Pot hole
Removal of Debris	- Trash
Defective Traffic Lights	- Traffic signal
Irregular Occupation	-Illegal occupation
Public Illumination	- Public lighting

Cleaning of Streets	- Street cleaning
Inappropriate Parking	- Illegal parking

3. Analysis of existing reporting system and improvement

Review of complaints claimed through Cheok Cheok Service during Apr 2014 through Mar 2015, for a year, was made by type of complaint and a typical selective error by type was also analyzed. Based on such analysis, the types of complaints were compiled again and the effect was verified through the case study.

3.1. Analysis of selective error in existing reporting system

The complaints claimed through Cheok Cheok Service during Apr 2014 through Mar 2015 totaled 8,336 and the report on road damage was 3,130(37.5%), 'Safety facility' was 1,734(20.8%), 'Ditch' was 393(4.7%), 'Rockslide/Landslide' was 151(1.8%), 'Snow removal' was 31(0.4%) and 'Others' reached 2,897(34.8%) In a bid to identify the percentage of selective error with the cause, in-depth analysis of total complaints (8,336) was implemented. Investigation focused on whether the reporting types were correct. As a result, wrong selection of reporting type because of selective error accounted for 17% which is equivalent to 1,436. According to reclassification of the complaints after correction, road damage was reduced by 152 to 2,987(35.7%), 'Safety facility' was reduced by 521 to 1,213 (14.6%), 'Ditch' was reduced by 27 to 420(5.0%), 'Rockslide/Landslide' was reduced by 42 to 109 (1.3%), 'Snow removal' was reduced by 3 to 28 (0.3%) and Others' was increased by 691 to 3,588(43.0%) (see Table 3).

Table 3 : Reporting types according to existing classification and re-classification

Reporting type	User's report		Re-classification		Typical selective error
	Number	%	Number	%	
Road damage	3,130	37.5	2,978 (▽152)	35.7	Road marking(lane, crosswalk) faded

Safety facility	1,734	20.8	1,213 (▽521)	14.6	traffic facility(sign, signal) damaged
Ditch	393	4.7	420 (▲27)	5.0	Gap by manhole cover
Rockslide / landslide	151	1.8	109 (▽42)	1.3	Falling object, obstacle
Snow removal	31	0.4	28 (▽3)	0.3	Steel grating damaged
Others	2,897	34.8	3,588 (▲691)	43.0	No description by phone calling

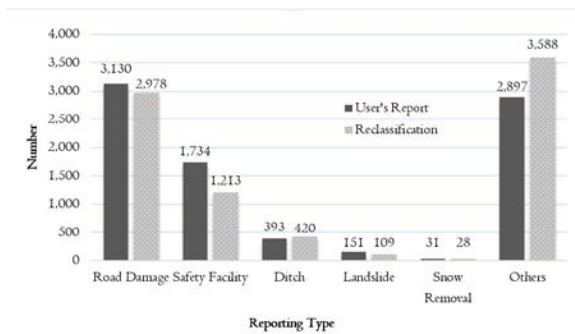


Fig. 1 Reporting types according to existing classification and re-classification

A typical example of reporting type was 'Others' which was chosen simply because of ambiguous classification. For instance, 23.2% ((35/151) of falling object or road kill was reported as 'Rockslide/Landslide' and 28.4% (823/2,897) was to 'Others' When it comes to traffic and safety facilities, 21.7% (377/1,734) was reported as 'Safety facility' and 13.4%(389/2,897) was as 'Others' Such selective error was attributable to classification system from the view of road management agency, which caused the road users to be confused with the technical terms and the selective error. Thus it's necessary to review the appropriateness of classification system in Cheok Cheok Service for reclassification so as to minimize the confusion and error in selecting the reporting type by road users. Furthermore, the time for report needs to be reduced to ensure the report in accurate and timely manner.

3.2. Reclassification of reporting type and analysis of the result

Classification of reporting system that may cause the driver to be confused would result in time delay and incorrect report as well as low reliability of the road management agency in dealing with the complaint. Hence, it's necessary to enhance the complaint and classification system, thereby mitigating the confusion in selecting the reporting type and simplifying the report process. In this study, revised classification of reporting system developed from road user's (reporter's) viewpoint is proposed to mitigate the confusion and the title was selected considering the characteristics of the complaint and the familiarity of the terms. Consequently, existing system classified into 6 categories was revised to 5 categories as follows.

- . (Existing) Road damage→ (Proposed) Poor road condition (road, shoulder, bike path, sidewalk conditions, for example, pot hole, crack, irregularity)
- . (Existing) Safety facilities →(Proposed) Road facility damaged or deteriorated (safety facility, traffic facility and other facility in detail, for instance, median, sign, signal, street lamp)
- . (Existing) Rockslide/landslide→(Proposed) Traffic obstacle (obstacle) (all obstacles on road, for instance, animal body, falling object, falling-stone, soil and others)
- . (Existing) Ditch→(Proposed) Poor drainage (ditch/ manhole cover lost/poor, clogged drain)
- . (Existing) Others→(Proposed) Others (snow removal, other living environment complaints)

As a result of reclassification of total 8,336 cases according to the proposed classification system, poor road condition totaled 3,166 (38.0%), 'Road facility damaged or deteriorated' was 2,049 (24.6%), 'Traffic obstacle' was 1,249 (15.0%), 'Poor drainage' was 419(5.0%) and 'Others' reached 1,453(17.4%)(see Table 4) "Others' according to revised classification was reduced from 43% to 17.4%, indicating the proposed system appears relatively specific as well as represents the report more accurately.

Table 4. Complaints according to proposed classification

Proposed classification	Note
-------------------------	------

Reporting type	Number (%)	(Existing classification)
-Poor road condition (pot hole, crack, irregularity)	3,166 (38.0%)	-Road damage -sidewalk/ bike path damage included in Others.
-Road facility damaged or deteriorated (safety, traffic and other facilities)	2,049 (24.6%)	-Safety facilities -traffic facility and road facility damage included in Others
-Traffic obstacle (including road, sidewalk, bike path)	1,249 (15.0%)	-Rockslide/Landslide -Road kill, falling object, road obstacle included in Others
-Poor drainage (manhole cover damaged/lost, clogged drain)	419 (5.0%)	-Ditch
-Others	1,453 (17.4%)	-Snow removal -Traffic violation and other living environment report included in Others.

and the outcome from the improvement includes; First, in existing system, the reports were concentrated on 3 categories including 'Others', as many as 93.1%, among 6 types. Particularly, Others which was designed to accommodate ambiguous situation only accounted for 34.8% which is considered too high. And 2 of remaining 5 types (65.2%) excluding Others accounted for 58.3% and remaining 3 types accounted for only 6.9%. Second, Others according to proposed classification system was 17.4% and 77.5% of remaining 82.6% was evenly distributed to 3 types among 4. Proposed system makes commitment to reducing the confusion of the complainants, simplifying the decision-making process for timely report as well as simplifying the process for the road management agency in dealing with the complaints so as to enhance the overall service quality.

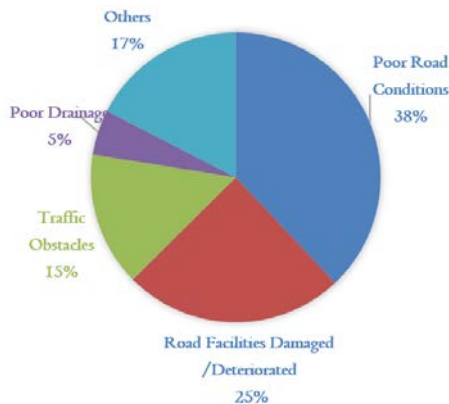


Fig 2. Complaints according to proposed classification

4. Conclusion

Cheek Cheek Service, which is the road management system encouraging the people to take part in the service, is intended to provide the assistance in dealing with the inconvenience to the road users in timely manner, thereby ensuring the safety and comfort for the users. This study makes commitment to improving existing road manager-centered classification system to road user-centered system

Acknowledgements

This research was supported by a grant from the Strategic Research Project (development of core technologies for road congestion prediction using automotive sensors and big data) funded by the Korea Institute of Civil Engineering and Building Technology.

References

- [1] MOGHA, "Living environment complaint center", 2016
- [2] MOLIT, "Road complaint center Cheek Cheek Service", 2016
- [3] Brazil, "1746(1-Rio)", 2016
- [4] Ministry of Land, Transport and Maritime Affairs, Manual and Guideline of Rule on the Standard of Highway Structure and Facility, 2009.
- [5] Ministry of Land, Transport and Maritime Affairs, Guidelines for road safety facility installation and management, 2014.