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Scientific techniques and road safety: a critical and analytical study in Metropolitan cities of Pakistan

Abstract:

Advance Technology has often been advocated as a mean of significantly reducing the incidence and severity of road crashes in metropolitan cities of Pakistan. It is a crucial determinant of national progress and competitiveness which help to address global challenges such as road safety. However, despite the new opportunities offered by globalization in recent year's many metropolitan cities of Pakistan have seen little improvements in productivity performance. In this paper benefactions provided by the modern innovation techniques such as Autonomous vehicle based system, electronic tachograph vehicle based system, and Harmonic radar system in tackling the road safety problems has been discussed in detail as well as list of road safety challenges are summarize in metropolitan cities of Pakistan. Moreover, in order to represent a grade of the traffic safety level this study entails a long discussion of multiple types of safe systems approaches that make possible to reducing the number of fatalities and fatality rates. The proposed research is based on descriptive and analytical research methods where primary and secondary sources are also consulted by the researcher. Thus the whole results suggest that modern day technology is having more on more of an effect on road safety. Particularly, in metropolitan cities of Pakistan where annually more than one million people die on the road. So therefore, in all these cities broadly assessable scientific education system needed that facilitates the adoption and diffusion of technology.

Keywords: road accident; vehicle innovation; metropolitan cities' of Pakistan; Road safety measures.

Introduction

The technological evolution in road safety vehicle is followed by complicated effect of the emergence of some milestone interaction integration and innovation. This success among diverse technologies provided a many of the crucial techniques insight that enable road safety progress. Road safety has often been recognized a major societal issue in which accident and subsequent injuries are predictable largely amendable and avoidable to rational remedy analysis (OECD: 2008). According to world health organization more than 1 million people are killed on the road each year. Compare to other developing countries Pakistan is among those twenty countries where road safety issue is calls for specific interventions Particularly in metropolitan cities included Karachi, Lahore, Islamabad, Rawalpindi, Gujranwala, Peshawar, Multan, Hyderabad and Quetta home to about 20 % population or having 35.3 million people carries 96 inland freight and 92 passenger traffic (www.citypopulation.de) see fig:1. This all indicated that though technology progress constitute an evolutionary road safety system in these areas punctuated by breakthrough changes But little changes also making process complicated. In this paper we will sort out development of key vehicle system to determine the crucial trajectories of road safety in metropolitan cities of Pakistan.

Literature review

Data for this study come from different sources. A systematic review of last five-year government statistics reports has been carried out whereas we use application of standard terminology in recognition of the fact that modern vehicle system have potential to solve the road safety problem. In addition to that indication of public opinion is being generated from questioners through electronic data base. Thus the Specific objective to this study are: to

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comprehend the magnitudes of road safety issue in context of modern innovation technologies. To explore the probable road safety challenges ahead and inclination of the safety measures of government in this regards.

year	Total number of accident	Punjab	Sindh	Khyber Pakhtunkhwa	Baluchistan	Total number of vehicle involved
2011-12	9140	4990	1054	2772	324	9986
2012-13	8988	4587	935	2968	297	9876
2013-14	8359	3696	945	3120	342	9423
2014-15	7865	3054	881	3399	315	8949
2015-16	9100	3288	924	4287	357	10636

Fig 1: Provincial analysis of traffic accident in Pakistan 2011-2016

1.1 Road safety challenges ahead in Metropolitan cities

Auto mobile sector is among the top growth sector in the large scale manufacturing in Pakistan. But unfortunately corresponding to last six year this sector had witnessed the remarkable growth and decline at the same time due to the revival of new auto companies dormant players, Kia motors, and Honda motors (Pakistan economic survey: 2017) see fig:2. It had two sided effects. On the one hand launching of new impressive model and implementation of urban transport scheme replaced the old dilapidated vehicles playing on the metropolitan areas. While on the other side this kind of technological evolution has alarming the road safety system. So the result is not only significant number of casualties' but also the extensive loss of scares sources.

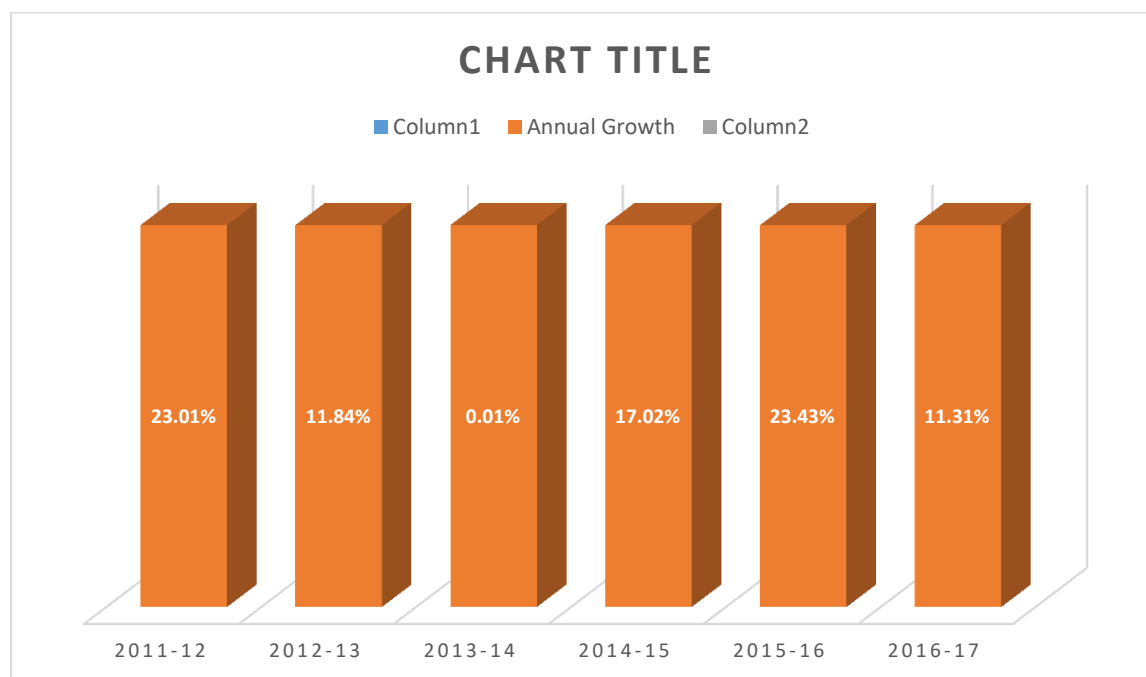


Fig: 2 Annual growth in Auto Mobile sector (source: Pakistan economic survey, Ministry of Finance 2011-2012)

Anyhow, in this regards to find out the causes of road safety issues in metropolitan areas survey was conducted by the researcher.

Material and methods:

It was a descriptive survey based on a census study and data of all accidents, occurred during 2011 from January to December 2017, was collected by using national highway and motorway police forms as: Preliminary accident report, Flash report, Initial information report, Follow up report from Motorway authorities. As it was a census study, no sampling technique was used. Following descriptive statistics were collected:

- Severity of accidents
- number of vehicle involved in accidents
- Types of vehicles involved
- Common causes of accidents

Complete confidentiality of the subjects was ensured by not mentioning their identity and data was collected after getting formal permission from national highway and motorway police authorities. Data was organized and analyzed by using SPSS version 21 and the Microsoft Excel 2010.

Results

Study Results show that excessive vehicle speed, increased freights transport, and low enforcement of safety restraints measures relatively keeping a high score in road safety problem. While the other factors like lack of consideration of pedestrian’s facilities in road design, parking management problem, transport infrastructure design, institutional barrier in urban and transport planning, and poor enforcement of operating agencies laws, notice a decline see fig:3.

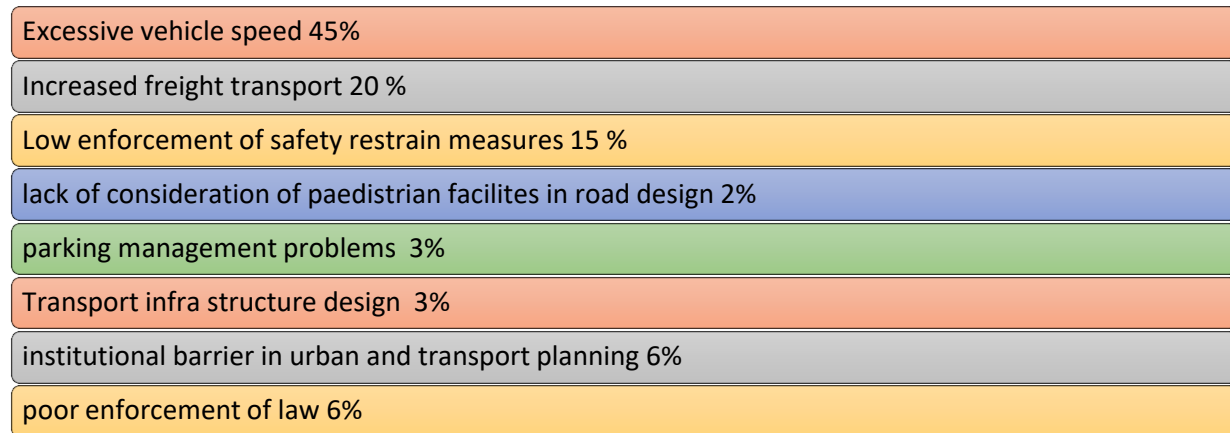


Fig: 3 results of Data Analysis

1.1.1 Advanced technological application for road safety

Advance technology are being applied to many transportation problems. There is an opportunity to tackle some of the seemingly intractable problems by innovative application of emerging technologies in the road safety area. The application of all these computerized electronical base application system in vehicles increase road safety, enhance mobility, reduced congestions and minimize environment impact as well as promote economic productivity for a healthier economy (Olson :1993). In this way here the most influential systems interpreted as Autonomous vehicle based system, Harmonic radar system, Electronic tachograph and In-vehicle recorder based system (Vaishakhi, & Ashish: 2012). All these system have potential to reduce the road crashes, and solve issue of pollution/energy problem as well as effective capacity to measure the quality of travel particularly in metropolitan areas of Pakistan.

1.1.2 Autonomous vehicle base system

Autonomous vehicle based system also known as autopilot automated navigational guidance system is a well-established vehicle based system used to ensure the safety and comfort in compact aerodynamically profiled vehicle (Sana-ullah: 2016). This kind of public transformation system has long been used in most of the developing countries to maintain a pre-set travel speed. This system has four major parts include vehicle control system, visual guidance system, visual piloting system, and robust communication system. All parts have machine vision to recognize marking of vehicle with a bar code and number plate that could be scanned automatically. Its key features involve with autonomous emergency braking adoptive cruise control lane that assist and enable automatic parking networking (Yeomans: 2014). As for as the road safety situation of metropolitan cities of Pakistan is concern the recent technologies of autonomous manufacture could use to improve the effectiveness of speed enforcement programmers. In addition to that it is as flexible as it can satisfy the dynamic demands of traffic safety that can easily be expanded to different roads lane with minimal time requirement. Moreover, there is many fitting electronic transponders in all those vehicle having this system which can records detail to trace the vehicle owner automatically (Howie: 1989). So it is north worthy to say that autonomous system has potential to reduce the huge investment which are needed to implant in metropolitan cities of Pakistan.

1.1.3 Harmonic radar system

Harmonic radar system is a non-invasive blind spot detection system used to evaluate the detection of vital sign in remote sensing vehicle. The origin of harmonic radar system can be traced back from 1960 when for the first time road safety issue has been raised in developing countries. Meanwhile, this application was widely influence the world wide road safety challenges. Harmonic radar system is based upon detective electronics devices fitted at vehicle which received reflected and emits radar signals from tags. An electronically tag can transfer a store message to a road side scanner. The fitting of passive harmonic reflector tags to object help to find out the location of the particular area (Howei: 1989). In order to get fruitful results, the Performance of this system ca be optimized and characterized by using various analytical empirical and numerical techniques. In Pakistan context one of the benefit of using harmonic radar is a driver information system that could led to a collision with a road side object to another vehicle as well as could be used to warn of the onset of hazardous situation. In order to allocate the improper performance of driver this system have also different transponders and frequency bands implanted along with search vehicle. That is the reason reliability of such system would be far greater than other (Rasilainen, 2015).

1.1.4 Electronic tachograph vehicle based system

Electronic tachograph means devises selected from a choice of mood. This device automatically records the distance speed together with driver activity. It has most obvious safety system fitted to a vehicle which can be used to monitor that appropriate breaks are taken (Howie: 1989). As for as road safety issue is concerned this system is classified into two broad categories i.e. digital tachograph and analogue tachograph. Analogue tachograph is retrieved visually considered as head of electronic tachograph. It can be assisted and electronically scanned through computer. Though this system does not provide any indication to the driver at the time to change the disc for safety measures. But it has a sufficient potential to corroborate the eye witnessed account after an accident (Eur-med transport project: 2015).

Digital tachograph is the disc type device that is mainly subject to tachograph rule. It is the digital version of analogue tachograph system fitted on passenger vehicle. The vehicle unit often recognize the brain of digital tachograph. It has following main parts vehicle unit, smart card, data vehicle registration system, and motor sensor (Bhoithre: 2006). All parts are used for multipurpose. One of the important characteristic of visual instrument in digital tachograph show measurement of travel distance speed and time on a range of vehicle. Other than that the popularity of its system arise from high survival rate of stored data maximum 28 days' worth data lies in unit memory and driver records sheet. However, compare to other system its most important contribution is its integrated users recording equipment in vehicle that can be easily installed by authorized workshop or by the manufacture of vehicle (Rychter: 2009).

2.1 Implication for prevention

The study of emerging technologies has provided a new way of investigating power to view and understand the modern world associated with road safety campaign. It appears to have subsequently affected the strong relationship

among three main road safety countermeasure summarize as educational measures, engineering measure, and enforcement measures.

2.1.1 Educational measures

Education as a road safety measure is used for all kind of road users group and for all sort of road user's issue. The nature of its measure Range from training young moped riders to driver improvement of convicted driver (Mckenna: 2010). The main Objective of these measure can be defined as achieving an optimal use of the transporting system with optimal system for all road users. The crash reduction could also be considered as the ultimate evolution criteria for the effectiveness of road safety education programed (Dragutinovic, Twisk: 2006). In metropolitan cities of Pakistan since 1997 till nowadays national highway authority and motorway police contributed to the development of a road safety culture in the community in term of knowledge skills and attitude required for safety behavior in traffic. In this way to accomplice the major task they are organizing programmed, seminar, workshop, and walk competition also set the scene for further initiatives by the collaboration of government such as fin-tech, robotic innovation center, digital skills training program, free learning speed checking squad, enroot vehicle checking and mobile education unit (Chattha, 2017).

2.1.2 Engineering measure

Engineering road safety interventions measures primarily concern with the treatment of road way. These wide range of measure included standardizing road width, geometric improvement, widening of dangerous curve, road side obstacle, fencing medians and barrier walls bus bays parking etc. (Pepagesrgiou, 2004). They play a crucial role in preparing engineers by developing skills provided road lightment of the installation of traffic calming scheme, which over time enable them to make responsible choices regarding improvement of road safety environment for all road users that meet the need of motor vehicle pedestrian cyclist and public transport users (Rospa: 2013). In context of Pakistan Engineering safety measures has been a major concern of highway authorities. Recently their dedicated effort took a lead in the strategic road infrastructure development through ongoing 50 Built operate and transfer project. Moreover, they also initiated 28 new network scheme comprise on 39 national highway motorway expressway roads by public private partnership (Pakistan economic survey: 2016).

2.1.3 Enforcement measure

Enforcement measures defined as enforcing laws and policies that are intended to regulate the behavior. It seeks to determine the activities coordination and functioning of different organization such as police, legislative bodies, road authorities and public organization either on the individual level or on society at large. Generally, a system approach and traffic law enforcement are used interchangeably (Polinsky & Shavell: 2005). A system approach looks at the traffic system interaction between road users and road vehicle in order to identify where there is potential to interventions as a whole. While Traffic law enforcement is one of the instrument of system approach which used to secure and improve traffic law compliance. It recognizes rectify and identify major sources of road safety error or design weakness that ultimately contribute to fatal and severe injury crashes as well as mitigate the severity (Makinen & Zaidel: 2002).

Enforcement measures often carries on in term of sanctions and monitoring. In practice the general characteristic of sanctioning is that they are not always determine in an optimal way. They can be implemented in shape of administrative and criminal fines, imprisonment, license sanction and even in point system. Camper to sanctions there are two standard of monitoring. The first technique is called stationary monitoring based upon random checking of mobile speed cameras test breathing check on seat belt or truck driver fatigue. While the second technique depends upon automated monitory devises mainly used for red light running and speed monitoring (Blondiau & Rousseau: 2013).

Conclusion

In a nut shell it is noteworthy to say that technology progress constitutes an evolutionary road safety system in metropolitan cities in Pakistan. On the one side this success among diverse technologies provided many of the crucial electronic based system insight that enable road safety progress while on the other side breakthrough changes making the progress complicated. In this way a comparative analysis of responses has demonstrated that in metropolitan cities road traffic security procedure from the point of enforcement has been remained unsatisfactory.

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Because there is enough resources, no integrated transport assessment system, flawed strategic vision of its leadership to build a massive road transportation infrastructure and most notably behavioral issues lies. This is possibly one of the major cause of mostly accident that Pakistan is hit harder than others.

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