



**INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS**

Name of the Student : Indresh Kumar Verma

Roll Number : 146105005

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Thesis Title: Identification of most suitable in-vehicle position of mobile-phone as navigation device for minimizing driver distraction: A study on drivers of Mobile Application Based Taxi Services (MABTS)

Name of Thesis Supervisor(s) : Dr. Sougata Karmakar

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SHORT ABSTRACT

With the advancement in technology, most drivers (personal as-well-as hired car) use mobile phones as portable navigation devices for cars. One of the detrimental effects of using mobile phones while driving is the distraction caused to the drivers, commonly referred to as 'driver distraction.' Sources of driver distraction can vary significantly; however, the literature review indicates that distracted driving due to mobile phone use has been identified as a significant cause of road accidents. Out of the different issues related to mobile phone use, while driving, the in-vehicle position of the mobile phone could be one of the lesser-explored causes of distraction.

Researchers have empirically examined the effect of the positions of car navigation display on eye movement and braking reaction time. Earlier studies related to the placement of in-vehicle displays and infotainment systems showed that positions of displays affect driver distraction and, thereby, driving performance. Hence, following the literature review, it can be concluded that driver-distraction due to the varied positions of the in-vehicle navigational device (like mobile-phone) might impact driving performance and consequently the possibility of road accident.

In India, Mobile Application-Based Taxi Services (MABTS) companies like 'OLA' and 'Uber' are using mobile-phone applications for executing their services. Although mobile phone is a major cause of distraction, its complete elimination is impractical, as it has become an inevitable part of driving, particularly for the drivers of MABTS. It was observed from the field study that mobile-phone used for navigation purpose was generally mounted at different locations on and around the dashboard and steering wheel, as per the driver's perception of convenience. Neither there is a guideline nor specific locations followed by the MABTS drivers for mounting their mobile phone for navigation purposes. Positioning the in-vehicle mobile phone at an un-optimal location would reduce the driving performance and increase the chances of accidents for the drivers. Hence, there is a need to study the suitability of in-vehicle mobile phone position

to ensure the minimum adverse effect on driving performance (lane keeping, error/ lapses, maneuvering) and minimal effort (bio-mechanical, reachability) while operating/ navigating during driving.

The study presented in the thesis attempted to find the most preferred/ suitable location for placing the mobile phone, used as a navigation device. The research framework has been presented in five phases.

In phase – I, the problem was identified, research questions raised, literature review, followed by research gap identification, aim & objectives were set, and hypothesis formulated.

In phase – II, a field study was conducted to identify the extent of MABTS drivers' involvement/ engagement in distracting tasks and their preference of location for placing the in-vehicle mobile phone used as a navigation device. A semi-structured questionnaire and a few open-ended questions were administered to the drivers.

In phase – III, digital human modeling (DHM) based study was conducted using the CATIA-DELMIA software. This study was carried out to identify the head (rotation, flexion/ extension), torso movement, and hand reachability required for easy information access from different in-vehicle mobile phone positions.

In phase – IV, an innovative self-adjusting mobile-phone holder was developed, which can be mounted on the hub of the steering wheel by adopting a systematic product development process. During phase – V, an empirical study was carried out on a driving simulator in a laboratory setup. In this study, the drivers' driving performance was measured using the lane change task (LCT), and visual behavior was measured using the eye-movement recorder.

This complete research to understand the distracting effect of mobile phones' position on the drivers was perhaps the first in the Indian context. The policy-makers/ road-transport authorities can utilize the current research findings for formulating guidelines for efficient and safe use of in-vehicle navigation devices. The MABTS companies can adopt the outcome of the research to develop guidelines and standard operating procedures (SOP) for the in-vehicle placement of navigational devices (e.g., mobile phones) by taxi drivers. Additionally, industrial designers can also use the knowledge to design mobile holders/ spaces integrated within the dashboard, keeping in mind smaller visual angles for safety and usability.