# REVIEWING THE COMPONENTS OF TECHNOLOGY ACCEPTANCE BEHAVIOR IN TRANSPORTATION SECTOR

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***Resume***

Technology integration in transportation enhances the efficiency towards urban mobility management. The effective implementation of such technologies requires exploration of vital factors of acceptance and use. This study synthesizes a review work on the road-transport technologies' literature from 2011 to 2021 by contemplating the adoption mechanism keywords such as "acceptance", "usability", "adoption" of technology in transportation, mobility and numerous transport technologies through Boolean operators. Total of 42 articles from 20 developed and developing countries are enlisted for analysis. Numerous Information System (IS) theories and behavioral dimensions are emanated from surveyed literature. Avoid-Shift-Improve (ASI) framework is also materialized to understand the inferences of reviewed articles. Study conclusions are debated for implications of transport technologies from citizens' perspective.

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## 1 Introduction

Metropolitans, being possessive of the elevated concentrations and growth of business and commercial activities, are multifaceted in nature verily affected by transportation system. As urbanization level upsurges, the mobility features across cities need to be updated, upgraded and integrated. To fortify the development and progress of cities to become smart ones, the smart mobility concept enhances the efficiency, ease of use and access of public modes of transport to mobilize the inhabitants in convenient way by using information and communication technologies [1]. In this era of digital economy and technological disruption, innovation in transportation has updated the mechanism as traditional transport system converted into Intelligent Transportation System (ITS). The ITS based various technologies aim to upgrade system, overcome challenges, and mitigate the risks in transport industry. The role of ITS covers transportation management, infrastructure, operation, policies and control methods [2]. The term, Intelligent Transport System (ITS), as main element of Industrial Revolution 4.0 (IR 4.0) [3], has numerous useful applications, like smart parking system, driver support system, Electronic Toll Collection (ETC), Highway Data Collection (HDC), Traffic Management Systems (TMS), Vehicle Data Collection (VDC) and Emergency Vehicle Preemption (EVP) etc. to make the life easy and manageable on roads. There is a wide array of advantages that can be obtained from the ITS deployments. Intelligent Transportation System (ITS) can perform the prominent role in managing traffic congestion, controlling road risks, reducing high accidents rate, carbon emissions, air pollution and, on the other hand increasing safety and reliability, travel speeds, traffic flow and satisfied travelers for all modes [4], [5]. The ITS has traversed various milestones from Artificial Intelligence (AI) to automated vehicles, from robotics to renewable energy [6] for developing the cities in smart environment towards better and convenient mobility facilities.

Being equipped with such ICT tools, the current situation of transport system still entails with challenges that need to be focused on. Rodrigue [7] explored that in this 21$^{st}$ century, the drivers used to spend three times more time on roads as compared to 20$^{th}$ century due to the high level of urbanization. Another similar report by Kapsch [8] showed that drivers consume an average of four year of their life (mostly time waiting in traffic congestions) in a vehicle. As concentrated urbanized atmosphere has escalated the congestion challenge that further called the issues of parking, fuel consumption, environmental impacts, infrastructures damages, mental health, and low productivity etc.

High integration of technology in transport system can cope with such challenges. As the Boston Consulting Group firmly considers prevalent acceptance of technologies could harvest considerable advantages. Such as eradicating road mortalities, refining travel time up-to 40 %, recuperating billions of hours vanished in traveling and congestion and producing overall recompences to public worth $1.3 trillion [9]. The fruitful implementation of Information System (IS) technologies require studying the factors influencing the acceptance and use of such technologies. Various studies have explored that proper adoption of technology in transport system, such as in electronic tolling, has played important role in congestion management [10], [11], smart parking for supporting urban mobility [12]. However, numerous researches pointed out towards the ineptitude of technology integration and challenges due to user's concerns and unwillingness [13]-[16]. Acceptance and integration of technology by users in a transport system is based on certain factors of their perception that primarily control the adoption decision of the technology. Jou et al. [10] considered that user attitude molds the behavior and this behavioral intention is responsible for taking any decision of acceptance and rejection. The attitude can be impacted by various factors to make positive (accept) and negative (reject) feelings [17]. To understand the user behavior and attitude towards innovations, certain expressions of IT theories should be considered.

There are various IT models and theories that facilitate the technology adoption by predicting the technology users' behavior and attitude towards acceptance of a system. Technology Acceptance Model (TAM) by Davis [18] is considered as a pioneer in this field of IT acceptance that also predicted the transport technology acceptance behavior. Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et.al, [19] undertook various technology adoption studies to fortify the proper acceptance of a system. Theory of Planned Behavior (TPB) deals with systematic drivers of human behavior towards certain innovation acceptance. In transportation sector, TAM and UTAUT models are widely used for acceptance assessment. As the effective realization of innovative transport system necessities to observe and examine the elements shaping the acceptance, a wide-ranging insight of transport technology acceptance studies is a matter of significance. The objective of this study is to determine the imperative aspects affecting the adoption of the road transport system technologies by undertaking a systematic review on the elements impacting the acceptance of technology in this field.

## 2 Methodology

The selection of keywords was based on objective of a study, which describes the investigation of factors for transport technology infusion among users/drivers. For such an intent authors adopted the keywords search strategies directed by Bramer [20]. It included the search of relevant studies that answer the study's aim and scope. From this preliminary search of papers, the relevant keywords were found that would yield out the related studies for the review. Authors classified two types of keywords that included 1) users behavior's action such as Acceptance, Adoption, Technology Usability and 2) Transportation Technology such as Automated Vehicle (AV), Electric Vehicles (EV), Automated Road Transport System (ARTS), Electronic Toll Collection System (ETC), Car Navigation System, Smartphone Driver Support System, Automated Parking System, Autonomous Vehicles etc. After finalizing above keywords, next step was to select the appropriate databases for searching the relevant studies that included Google Scholar, ACM Digital Library, IEEE Explore, Science Direct, Springer, Scopus and Web of Science (WoS). We used the Boolean operator for searching the required studies such as Acceptance OR Adoption AND Electric Vehicle OR Car Navigation System etc.

The inclusion and exclusion protocols were used to refine and pinpoint the suitable studies for this systematic review work (see Figure 1). The basic inclusion criteria consisted of the article language and timeframe. This catalog hunt was comprised of 256 articles with the timeframe of 2011 to 2021. As technology integration and innovation diffusion were seen prevalently in the last decade and specifically since last couple of years during pandemic era, therefore this timeframe was selected to comprehend and explore the recent and advanced technology diffusion in transportation sector from users' perspective. Only English language articles were considered for the analysis. More inclusion criteria, such as type of study (i.e. empirical and quantitative research work only but no review work or editorial or technical notes), peer reviewed papers (i.e. original articles only and no preprint or repository work) and Journal articles (i.e. complete research work only and no conference proceedings and book chapters) were also considered in literature searching process. As the aim of this work was to synthesize the elements of acceptance and adoption behavior of transport technology users, the theoretically supported studies were considered only. Information System theories supported inferences are more viable in terms of expanding the body of knowledge. Quality of articles was assessed based on peer reviewed nature of studies and respective journal indexing such as only articles from those journals were included for the survey that were indexed in Scopus and/or Web of Science databases for last 5 years, as publications in Scopus and WoS database are aligned with integrity and higher standard of research output. Inclusion criteria also entail the focus of the road technology studies only. Additionally, articles that focused on citizens adoption of transport technology were

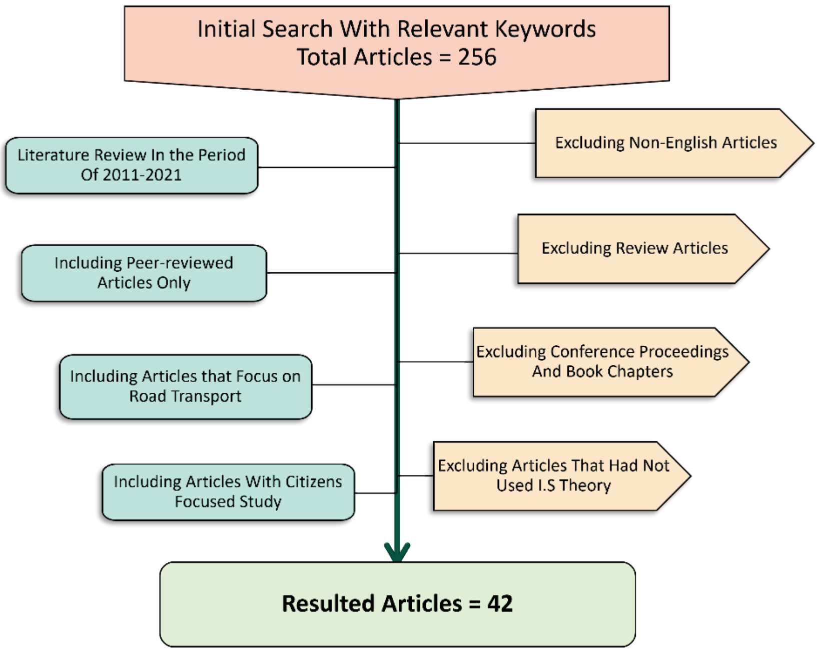


***Figure 1** Inclusion and Exclusion Criteria*

included only. The purpose of the transport technology is to integrate the smart mobility in societies, therefore only citizens' centered studies were included and non-citizens' research work was disregarded for this study. Moreover, the assessment of search criteria and quality to ensure the fairness and reduce the biasness, the STROBE technique is used. This technique is based on 22-items checklist that refers the guidelines for selected article. These guidelines are based on article contents like title, abstract, introduction of matter, methodology techniques, results expressed and conclusion of proper should be according to standards of STROBE.

## 3 Results and discussion

The total number of articles that considered after inclusion and exclusion criteria for this review research were 42. Table 1 shows the transport technologies that are investigated for this research. Electric cars have 7 studies and automated vehicles technologies are the highest in number with 10 articles. Electronic tolling and car navigation system have 4 studies each and smart parking has 3 and driver support system comprises of 2 studies, while other transportation tools and technologies, such as ridesharing related technologies and public transport linked tools etc. are listed in miscellaneous section and there are 12 studies in this category. Table 1 also explores the usage of IT theory in reviewed articles. Technology Acceptance Model (TAM) has appeared in 20 articles as a suitable IT theory for predicting the user behavior in transportation sector. Unified Theory of Acceptance and Use of Technology (UTAUT) is considered in 7 studies for technology acceptance. Theory of Planned Behavior (TPB) is undertaken by 4 studies to formulate the user behavior. Diffusion of Innovation Theory (IDT) is used by one study. There are 10 studies that had utilized the combination of discussed theories (TAM, TPB, UTAUT, IDT) to formulate better scenario for behavioral intention towards the transportation technology acceptance. To conclude the results of collected data, articles from various databases were published by numerous research publication platforms. Out of 42 articles, majority of papers i.e. n = 24 (57%) was published by Elsevier (see Figure 2). Most researched transport technologies are Autonomous vehicles (n = 10) and Electric vehicles (n = 7) followed by navigation system, e-tolling and smart parking technologies (see Table 1). Around 50% of studies (n=20) considered the TAM model for behavior prediction followed by UTAUT and TPB while higher trend of combining these IS models and adding the external variables is also orchestrated (n = 10) (see Table 1). Among reviewed articles, 8 studies are published in China to comprehend the behavioral modelling for transport technology followed by South Korea (n = 5) and Taiwan (n = 3) (see Figure 3). Geographically, the most part of studies i.e. 54% were conducted in Asia Pacific region (n = 23). Among 42 articles, around 30% of papers (n = 12) were published in 2021 that shows the significance of investigating topic and tendency of research in this segment. It shows the technology integration strategies by government in the region to obtain the sustainable urban mobility.

Numerous technologies of transportation system, such as electric vehicles, automated vehicles, RFID sensors, parking system, car navigation system, etc., are analyzed and observed through selected articles of adoption mechanism. These technologies have become the matter of interest for the governments

***Table 1** Articles searched containing the adoption of transportation system technologies*

| Topic | Articles | TAM | TPB | IDT | UTAUT | Combined |
|---|---|---|---|---|---|---|
| Car Navigation System | 4 | 2 | | | 1 | 1 |
| Smart Parking | 3 | 1 | 1 | | 1 | |
| Electronic Tolling | 4 | 3 | | | | 1 |
| Driver Support System | 2 | 1 | | | | 1 |
| Automated Vehicles | 10 | 4 | | | 2 | 4 |
| Electric Vehicles | 7 | 2 | 2 | | 2 | 1 |
| Miscellaneous | 12 | 7 | 1 | 1 | 1 | 2 |
| Total | 42 | 20 | 4 | 1 | 7 | 10 |

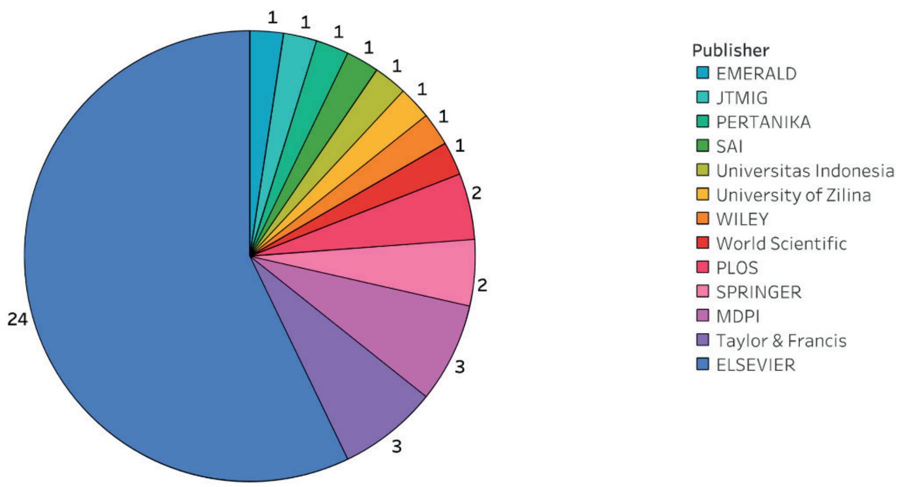


***Figure 2** Articles by Publisher*

and authorities in recent days due to challenges in mega cities are mounting the congestion intensity, fatalities on roads and environment hazardous [21]. Intelligent Transportation System (ITS) provides the solutions for these issues by congestion charging, smart parking system, environment friendly vehicles, internet of things based sensors support system in vehicles [22]-[24]. The studied articles encompass wide variety of ITS technologies that provide the solutions for smart mobility. Besides this, these studies covered the empirical evidence of advanced technology adoption in developed countries and show the urgency of authorities to prioritize the transport-tech for sustainable urban development.

Among studied digital transport services, autonomous vehicles are trendy now a days due to integration of Artificial Intelligence in transport sector that enables the efficiency and accuracy on roads, however, safety is still the main issue in its adoption. The adoption of Autonomous vehicles is mainly investigated in China i.e. a study on unmanned cars' utility assessed by the TAM model where perceived enjoyment and perceived trust in technology found most influencing element towards adoption [25] while another study contemplating TAM and IDT in adoption of autonomous cars concluded with the fact that Perceived Usefulness (PU), relative advantage and result demonstrability can help to integrate the acceptance level [26]. In Slovenia, autonomous vehicles acceptance among millennials was investigated by UTAUT and included the safety concerns at higher level compared to benefits of autonomous cars towards adoption mechanism [27]. Trust as acceptance antecedent was validated in South Korea through the TAM model with significance role PU [28]. The PU and PEOU of TAM models appeared as key predictors of driverless cars in USA [29]. Meanwhile a study pertaining the case of developing country i.e. Vietnam also explored the autonomous vehicle adoption system and showed the financial risk and time risk as the significant factors to manage the acceptance [30]. As autonomous vehicles are not limited to personal cars, but buses, shuttles and other modes of public transport also managed by artificial intelligence and no-driver required to operate. In China, autonomous buses can be accepted by citizen upon perceiving the higher level of trust and perceived usefulness [31]. Similarly, trust and compatibility in accepting the autonomous shuttles as a mode of mobility plays vital role in a German study [32]. Perceived Enjoyment and Performance Expectancy are emerged as important factors in Greek autonomous public transport adoption [12]. In Ireland, adoption of the autonomous public transport and driverless shared vehicles underlined the TAM and TPB and found that Perceived Behavioral Control, Perceived Usefulness

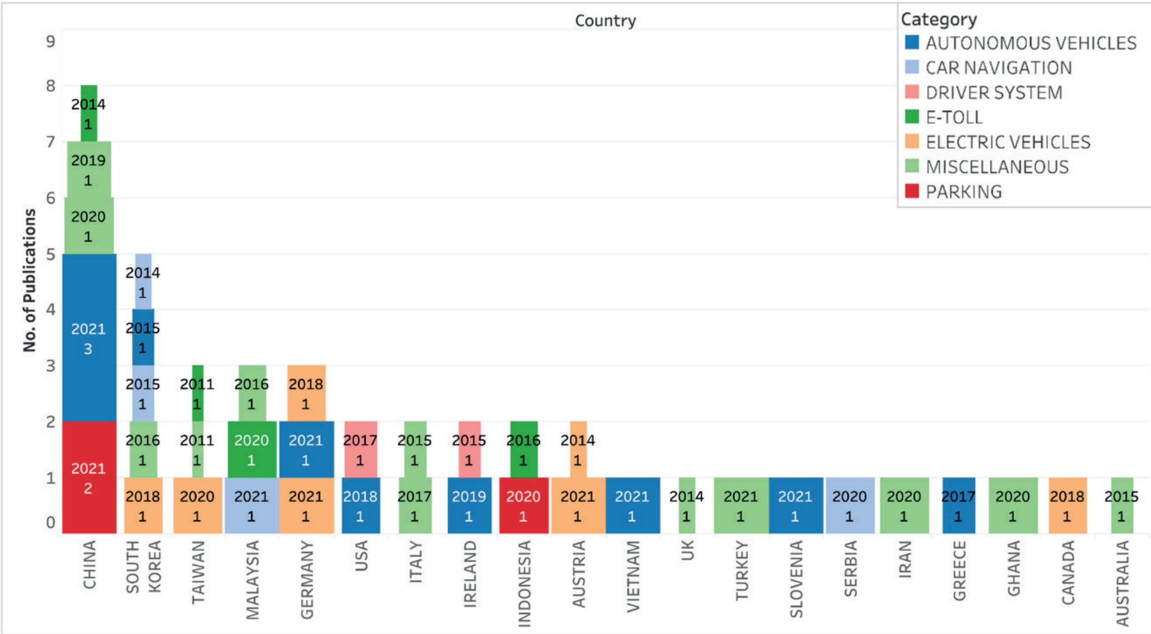


***Figure 3*** *Reviewed Articles by Countries w.r.t Category and Year*

and Subjective Norms were the main elements to shape the behavioral intention of citizens [33]. Autonomous vehicles adoption mainly depends on trust level of technology and the safety concerns associated with the system can be addressed by more efficient and sustainable system integrity, rules and regulation by authorities and distinct lane and route distribution of driverless cars at trial basis for the long-term benefits and mass integration.

Electric vehicles are hot topic in transportation technology and sustainable mobility. They include the personal cars, public buses, tri-wheelers and two wheelers (scooters and bicycles). Electric vehicles recognition is also interpreted as widely used technology of transport system in reviewed papers. Being environment friendly and convenient one, electric vehicle adoption positively influenced by perceived usefulness, satisfaction and attitude while perceived cost found as hurdle in acceptance of electric vehicle technology [34]. While using the TPB theory, the Attitude and Perceived Behavior Control emerged as strong stimulators of early adopters in Canada for electric vehicles [35]. In Germany, the early adopters showed Perceived Organizational Usefulness and Social Norms as main ingredients of electric vehicles acceptance through the Structural Equation Modeling [36]. Towards electric bicycle in Austria, the Perceived Usefulness, Perceived Ease Of Use and Environmental factor, possessed the significance towards shaping adoption behavior [37]. To comprehend the citizens behavior towards acceptance of e-scooters for urban and short-distance mobility in Germany, UTAUT model was used to validate the behavior modelling by expounding the personal benefit and convenience as vibrant behavior predictor [38]. E-Scooters' adoption studies in Taiwan [39] and Austria [37], [40] predominantly used the TPB theory where Perceived Behavioral Control and Social Influence played main role to shape the behavior. Electric mobility resources are prevailing in developed countries by considering the sustainable urban mobility a crucial for future cities. Minimizing the dependency on gasoline-powered cars, buses and two-wheelers by promoting environment friendly e-cars, green buses and e-scooters to protect the environment, cities livelihood and healthy urban atmosphere. To attain this milestone, the adoption of e-vehicles is mainly dependent on the word-of-mouth about usability scenario because perceived enjoyment and usefulness of technology are largely acknowledged by citizens in reviewed articles and infusing the "good word" at mass level could help for higher level integration. By keeping this in mind, government should promote it through multiple ways as transforming the public transport to electric ones, encouraging the e-vehicles import or production capacity and motivate the micro-level usability of e-scooters for better future.

As urban and highway mobility entails the tolling and parking mechanism, the transportation technology orchestrates the advanced technology for system integration, safety and time saving tools to support the government in toll collection, on road vehicles, managed parking and travel behavior of citizens. Such technology supports the vehicles to ploy on roads with organized intelligent transport system. In such a way, Taiwan implemented electronic tolling on its highways to enhance the efficiency of tolling and combat the congestion issue in 2006. However, the proper adoption was not achieved until the government understood the crucial factors impacting the decision making of highways users to adopt RFID tags. The TAM model and Theory of Planned Behavior with external constructs were assessed that concluded in prominence of role of media and word of mouth towards adoption of e-tolling [10].


***Figure 4*** *Word Cloud of Most Impact Variables in Reviewed Papers*

Indonesian study on e-toll established the significance of Perceived Usefulness and Perceived Behavioral Control [11]. In Malaysia, the RFID tag for e-toll, smart parking and electronic road pricing is being implanted and to understand the netizens behavior towards its adoption was assessed by TAM model which in result explored the vibrant role of Attitude (backed by PU and PEOU) and Subjective Norms [41]. Similarly, a TAM-based Chinese study validated the E-toll adoption through the TAM model and resulted in presenting the Social Influence and individual characteristics as the main antecedents of behavior shaping of individuals [42]. The sensor-based technologies in vehicles inside the urban spaces possess the quite a prominence regarding the parking purpose. Using the UTAUT, an Indonesian study towards urban parking technology acceptance showed the Facilitating Conditions as a key predictor among netizens [43]. More studies on parking technologies revealed that Perceived Usefulness with Perceived Network Externality in shared parking [44], Perceived Risk with role of gender for deciding the shared parking versus conventional parking [45] can play important part in adopting the smart parking tool.

Technologies inside the vehicles play noteworthy part to engage the citizens on road with complete information of surroundings, connectivity and safety assurance such as car navigation system, driver support system etc. Usability of these tools was mainly validated by the TAM and UTAUT models. According to multiple studies from South Korea, Quality features of car navigation system [46] and Perceived Usefulness of such tools [47] can become the adopting triggers among citizen while in Serbia, installing telematics for cars insurance purpose was supported by Facilitating Conditions [48]. Social Influence and Usefulness can change the netizen behavior in Malaysia to use dashboard cam [49]. Adoption of Smartphone driver assistance mechanism in Ireland was also backed by Perceived Gain and Usefulness with Social Influence [50]. In a similar study in USA, to prevent the accident on highways, advanced driver assistance system was validated through TAM variables [51]. Technology to assist the drivers on roads and prevent the unfavorable situation are backed by quality features, perception of benefits and views of society to accept or resist. However, the road safety measurement should encourage to utilize the in-vehicle digital tools for safe and managed travelling.

In miscellaneous category, there were assorted studies on public transit technology, ridesharing apps, sustainable mobility tools for netizens etc. These studies had analyzed the citizens behavior through TAM, TPB and UTAUT and most of the articles were describing the public transport digital tool. Such as for public transit commuters in Taiwan, [52] and UK [53], and mobile payment for public transport in Italy [54] were resulted in importance of potential significance of system. While towards car drivers, in Australia, ITS tool for railway crossing system was measured for adoption through the combined theoretical framework where PBC and SN were prominent behavioral factor [55]. Similarly, system quality of the ITS mechanism in Malaysian roads was accepted through its usefulness (PU) [56]. To manage the bicycles detection on roads, drivers acceptance was measured by the TAM model in Italy [57]. Travelers adoption of variable message signs on roads in China was also validated by TAM model [58]. Ridesharing is the most famous digital transportation service and its adoption through various social and contextual elements is important for sustainable mobility. Muti-modal trip-planning app in Turkey [59] and ride-sharing service in China [60] were mainly adopted through the PU. To accept the bicycle sharing system in Iran, Facilitating Conditions from UTAUT emerged as vibrant factor of adoption [61]. Ridesharing in a less-economically developed country i.e. Ghana, depended on level of education of respondents [62].

Higher level of acceptance of the ITS solutions (as explored in reviewed papers) ensures the management of mobility tasks. Technology Acceptance Model is used by substantial number of studies in innovation or information system adoption. Lai [63] conducted the review of technology adoption by theory studies and found that the TAM model was the most used one for any type of technology acceptance. He further explained that TAM model defined the ways, why do the acceptance and rejections of respective system occur. Taherdoost [64] conducted the technology acceptance review and found the importance of TAM among several models. Therefore, in transportation system, the TAM model is also prevailing in most studies. However, assessing the technology adoption through blending the multiple models also apparent and evident in the study [65].

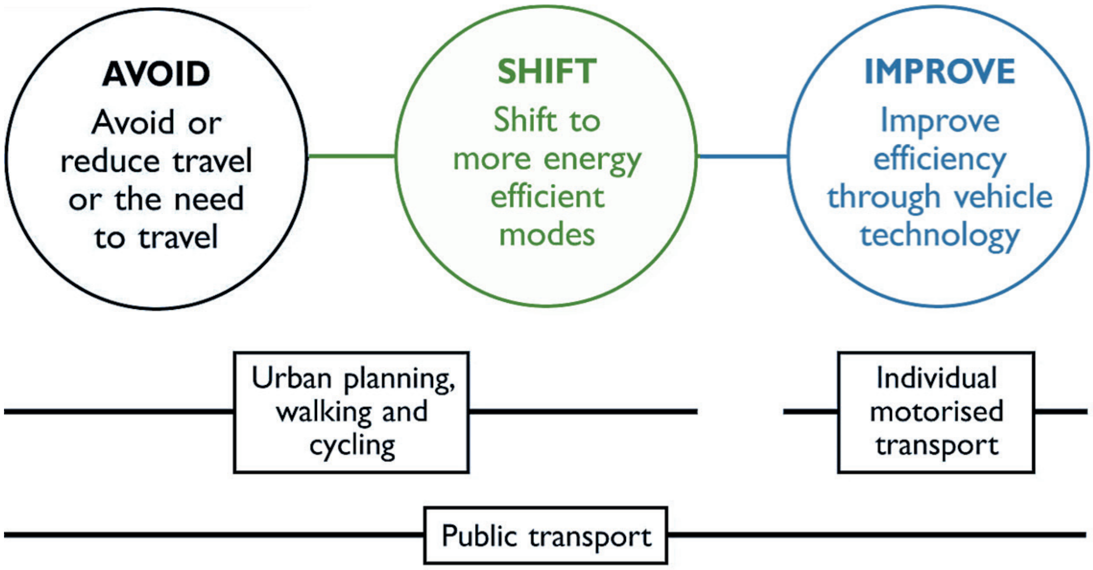


***Figure 5** Avoid Shift Improve (ASI) framework*

However, combing the TAM , TPB and UTAUT model also resulted in TAM notoriety for predicting behavior for technology adoption [51].

Perceived Usefulness (PU) is the main construct in TAM model that depicts about the advantageous nature of technology while another construct of TAM is Perceived Ease of Use (PEOU) which talks about the convenience usage of that technology. Both of these factors are major contributor towards impact on attitude and behavioral intention of users. Attitude refers to positive or negative assessment due to features of a system that intended to use. Behavioral Intention of user is considered as the behavior of user towards the certain innovation or system acceptance or rejection. Social Norms are the societal influence to accept and adopt the technology. Perceived Behavioral Control is provocation of human behavior that enables to accept the system based on certain stimulators. Performance Expectancy in UTAUT model is parallel to Perceived Usefulness of TAM model, which relates with efficiency in performance by usability of the specific system. Table 1 explores the transport technology adoption as per theory to assess the user behavior. Here, the TAM model is prevalent, UTAUT and TPB also have strong influence towards behavioral shaping. There are various variables reviewed in the papers, which had significant impact on behavioral intention. A word cloud is shaped in Figure 4 to follow most impacted variables across the reviewed articles.

As adoption of any technology is a basic step towards future oriented pattern of usability therefore understanding the antecedents and factors of significance will help the stakeholders to fortify the plan of action. The rationale of this study is to understand the infusion of technological pattern according to users' behavior, which in return will help to improve the sustainable mobility practices. This impression is based on the Avoid-Shift-Improve (A-S-I) framework, which is modelled by German authorities in 1990s era to develop the sustainable urban mobility strategies [66]. The A-S-I framework, as depicted in Figure 5, is based on the three strategies i.e. Avoid the travel activity through certain modes of transport such as prevent cars usability in cities and Shift to public transport or Avoid the gasoline powered vehicles and Shift to electric vehicles or Avoid the mobility activity through any vehicles and Shift to walking or cycling inside the city for sustainable mobility practices. When Avoid and Shift are not feasible then Improve strategy is implemented by managing the technology for individual motorized mobility such as connectivity, automation and sensors in the vehicles. In this study, the Shift and Improve strategy (specifically) is being focused by contemplating the factors that play significant role to support stakeholder for sustainable mobility strategy.

The analysis of reviewed articles explores that in order to implement the autonomous vehicles (the Improve strategy of A-S-I framework), safety, security and assurance of managed control should be kept in mind. Driverless cars or semi-autonomous vehicles are merely adopted based on the safety measures, while autonomous public transport such as shuttles, buses or trains are smoothly accepted by the netizen due to trust level in authorities. To infuse the autonomous public mobility initiatives, it is suggested to focus on quality of services and ease of use of service for mass integration. Similarly, sensors and devices in the cars for parking, e-tolling, navigations and support gadgets are infused by their perception of benefits, facilitating circumstances, and quality of service. Such tools are also backed by society influence where people adopt the respective technology by realizing its usage worth among other people's action. While choosing technological services for ridesharing, mobility as a service (MaaS) and trip planner, the usefulness and usability ease can enhance the individuals' choice of mobility patterns. Regarding electric vehicles which support the Shift strategy of A-S-I framework, the mechanism is already diffused by early adopter in many developed countries in the shape of personal conveyance and micro-mobility scooters etc. A better word of mouth regarding the benefits of e-vehicles in the society would be quite resourceful for the mass adoption. E-scooters for micro mobility would be the solution for heavily car-congested urban roads. Stakeholders should promote the usability of such practices by encouraging the mobility startup towards e-scooter initiatives. Authorities would also gain the useful outcomes by e-buses implementation, since as per users' point of view, innovative technology with less effort is suitable for mass adoption.

## 4 Conclusion

The objective of this study was to determine the imperative aspects affecting the adoption of road transport system technologies by undertaking a systematic review on the elements impacting the acceptance of technology in this field. This systematic review is led by searching of numerous keywords such as adoption, usability, acceptance of IT in transportation, highways and information system models in transport services through the Boolean operators. Authors also examined the different vital technologies, such as Autonomous Vehicle (AV), Electric Vehicles (EV), Automated Road Transport System (ARTS), Electronic Toll Collection System (ETC), Car Navigation System, Smartphone Driver Support System, Automated Parking System and other technologies (i.e. in vehicles and on roads) in the 2011-2021 period. There are 42 articles enlisted in this study that shrouded adoption mechanism of advance technology in the transport system in 20 developed and developing countries. The technology acceptance model (TAM) has appeared to be the most significant model used to predict and point out the determinants influencing the acceptance of technologies in road transport system; in addition the Unified Theory of Acceptance and Use of Technology (UTAUT) model and Theory of Planned Behavior (TPB) have also covered many applications in recent years in the transportation system. Perceived usefulness, convenience in usability, social influence, facilitating circumstances, attitude and behavioral control and behavioral intentions of end-users are effective in the adoption of modern transport system. By contemplating numerous factors like usefulness, ease of use and social influence, the adoption rate of transport technologies can be amplified to make better achievement of smart mobility.

The study elaborated the phenomenon of adopting the smart mobility solutions and key determinants of smooth acceptance of technology in transportation. The TAM model demonstrated its eminence in technology adoption literature, particularly its nature of combining with external variables and other theories made it forerunner towards advanced technologies. The Unified Theory of Acceptance and Use of Technology (UTAUT) model, being an advanced extension of TAM, also showed the significance in predicting the digital technologies in transportation. The study encapsulates the suitability of combining the TAM and UTAUT models for better assessment of behavioral intention of technology users. The research fortified the value of main construct of the TAM, i.e. Perceived Usefulness as key determinant of transport technologies. Social influence has also captured the prominent place in behavior shaping in reviewed studies.

As per A-S-I framework, the inferences will support in Shift and Improve strategy as majority of reviewed article were discussing and pointing towards adoption of individualized transport technology to Improve the vehicle technology and some articles also discussing how to Shift to energy efficient mode of mobility. The research will support the authorities to devise the effective policies for technology implementation through the ASI framework, as to implement Shift strategy, the positive word of mouth of technological gain should be focused. To implement Improve strategy, privacy concerns in automation and social influence with service quality in sensors should be concentrated. The vital features and elements of technology should be communicated through the mass media and word of mouth. The sense of significance of technology enhances the technology adoption. Technology cannot be diffused in organization without willingness of individual behavioral system. As this research has reviewed the articles, which are condensing the mobility challenges and solutions of developed countries, it would contribute to literature for future studies of developing nations to foresee the mobility solutions. The study is the first step towards realizing the technology and human behavior in road transportation; however, further work in this field would outcome in more useful and resourceful inferences. The study is limited to road transport technologies; future studies should consider the other modes of transportation such as logistic, rail, air and maritime for more concentration of diverse technology integration, such as maritime autonomous surface ships, blockchain adoption in the aviation industry, LNG as an alternative fuel, port digitalization, automated road transport logistics and road freight transport mechanism etc.

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