



EXAMINING VEHICLE USERS' WILLINGNESS TO CARPOOL: EVIDENCE FROM SRI LANKA, A LOWER- AND MIDDLE- INCOME COUNTRY

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ABSTRACT

Carpooling, as a shared mobility option, offers a means to reduce single-occupancy vehicle use and promote sustainable travel behaviour. While many studies have explored carpooling in developed countries, there is a growing need to consider context-specific factors influencing the participation of vehicle users in lower- and middle-income countries (LMIC). This study employed a mixed-methods approach, combining interviews and surveys, to examine carpooling behaviour in Sri Lanka. The interview data were analysed thematically, while the survey data were examined using descriptive analysis and hypothesis testing to identify the key factors influencing the willingness to carpool. This study explores the willingness of private vehicle owners in Sri Lanka, particularly work commuters, to share empty vehicle spaces as potential carpooling facility suppliers. While carpooling remains unfamiliar to many, the participants expressed optimism regarding its potential to reduce traffic congestion. The ranking results indicated that the participants prioritised vehicle efficiency, comfort, cost savings, and personal security. Age was a stronger determinant of willingness than gender or education, with 25–35-year-olds most receptive, mainly for commuting to work, and valuing features like assured matches and safety protocols. These findings support the development of targeted policies and digital solutions that align with user needs and mobility patterns in emerging urban contexts.

Keywords: *Carpooling, sustainable transportation, willingness to carpool, vehicle type, sharing economy*

1. INTRODUCTION

Carpooling has emerged as a promising solution with significant potential to reduce traffic congestion and environmental impact [1]. Carpooling involves multiple individuals sharing a single vehicle to travel together, thereby reducing the number of single-occupancy vehicles on the road and contributing to cleaner air and lower emissions [2], [3]. However, carpooling adoption in low- and middle-income countries (LMIC) remains limited because of a lack of public awareness and government incentives [4]. This study aimed to identify the factors influencing drivers' willingness to carpool, focusing on working professionals in Sri Lanka. This study examines the attitudes, preferences, and concerns of private vehicle owners who commute to work in Sri Lanka towards carpooling, identifying key barriers and opportunities to encourage increased participation and build a more sustainable transportation system.

Factors such as vehicle characteristics, cultural and societal perceptions, and the inclusion of extra features such as entertainment systems, comfort facilities, and safety measures influence preferences for carpooling [5], [6], [7], [8]. This study considered private vehicle owners as potential suppliers of carpooling capacity and potential users. Although the existing literature has highlighted the factors that influence carpooling in a global context, there are gaps in understanding the applicability of such factors in varying settings, such as in LMICs, which have different modal compositions, preferences, and attitudes. The extant literature has also indicated the importance of learning from different contexts, given the impact of contextual factors on carpooling [9]. Furthermore, the influence of vehicle type has rarely been studied in a global context due to variations in vehicle availability across countries. This study aims to address this gap by examining a comprehensive set of factors influencing the willingness of private vehicle owners who commute to work in an LMIC to participate in carpooling, with a particular focus on the role of vehicle type, given the range of commuting modes such as cars, vans, three-wheelers, and two-wheelers compared to developed countries.

2. LITERATURE REVIEW

Several studies have investigated the factors influencing carpooling in different contexts. This section categorises key studies into economic and financial incentives, social and behavioural influences, policy and infrastructure support and context-specific insights.

2.1. Economic, Behavioural and Institutional Factors Influencing Carpooling

Carpooling behaviour is shaped by economic, behavioural, and institutional factors that impact individuals' willingness to share rides. Tahmasseby et al. [2] emphasised that addressing these factors is crucial for enhancing real-time carpooling demand, particularly in Canada. Their findings suggest that economic incentives, trust in co-riders, and institutional support play significant roles in fostering adoption of these services. Similarly, Le Goff et al. [5] identified time, convenience, economic considerations, and environmental awareness as key determinants influencing the shift from solo driving to carpooling in Lyon. This study highlights how monetary incentives and social norms can create a conducive environment for carpooling uptake. A broader international perspective on carpooling behaviour was provided by Gheorghiu and Delhomme [7], who noted that in France, carpooling was more prevalent for leisure and shopping trips than for work commutes. This suggests that the optional nature of carpooling for non-essential travel may contribute to a higher adoption rate in such scenarios.

2.2. Psychological and Social Influences on Carpooling

The psychological determinants of carpooling have been explored through behavioural models such as the Theory of Planned Behaviour [10] and the Norm Activation Model [11]. Bachmann et al. [6] applied these frameworks in Switzerland to examine passengers' and drivers' intentions to carpool. Their findings suggest that trust, social norms, and perceived behavioural control significantly influence carpooling decisions. Similarly, Gheorghiu and Delhomme [7] found that social pressure and perceptions of public transport influenced carpooling choices, particularly in France. These studies suggest that while economic incentives are crucial, social acceptance and trust are equally important for fostering carpooling habits.

2.3. Importance of Policies to Drive Carpooling

Teal [3] provided one of the earliest comprehensive analyses of carpooling, examining its historical evolution, financial incentives, and socio-demographic characteristics. This study framed carpooling as a response to economic crises and policy interventions, shaping its development over time. More recent work by

Buliung et al. [12] examined carpooling through the lens of Transport Demand Management (TDM) strategies, highlighting its role in mitigating congestion, reducing travel costs, and addressing urban mobility challenges. Their synthesis of earlier studies underscored the need to integrate carpooling within broader transportation policies and land-use planning to promote carpooling as a viable transport mode. Waerden et al. [13] conducted a stated choice experiment to examine how policy measures could encourage drivers to switch from solo driving to carpooling for work commutes. Their findings suggest that better infrastructure, employer incentives, and targeted marketing strategies could enhance carpool adoption. Similarly, Guensler et al. [8] analysed high-occupancy toll (HOT) lanes in Atlanta, where carpooling was found to be influenced by pricing strategies and commuter perceptions of travel time reliability. This study reinforced the idea that financial incentives, when aligned with policy measures, could significantly impact carpooling adoption.

2.4. Carpooling Developments in LMICs

In LMICs, carpooling has gained attention as a cost-effective and sustainable solution to address urban transport challenges, such as congestion, fuel affordability, and insufficient public transport coverage [9], [14]. Several barriers hinder the structured development of carpooling in LMICs, including concerns about personal safety, lack of regulatory support, limited access to enabling technologies, and deeply rooted preferences for travel autonomy [14]. However, research shows that enabling factors such as strong social ties, cultural familiarity with shared rides, and high tolerance for vehicle occupancy present opportunities for scalable carpooling models [15], [16].

Recent studies from countries such as India, Brazil, and South Africa have demonstrated promising developments, including mobile-based carpooling applications tailored to local needs, employer-sponsored ride-matching schemes, and pilot projects integrating carpooling with public transport services [1], [14], [15]. These initiatives highlight the importance of designing context-sensitive solutions that address both structural limitations and user-specific concerns in LMICs.

Although Sri Lanka lacks extensive research on formal carpooling schemes, studies on ridesharing provide valuable insights into the behavioural motives and challenges. Kandanaarachchi et al. [17] highlighted safety concerns in developing countries and emphasised the importance of addressing user attitudes toward security in shared transport settings. Silva and Bandara [18] examined ridesharing on Sri Lanka's Southern Expressway and revealed how flexible transport solutions could mitigate congestion and improve mobility. Jayasinghe and Thillaiampalam [16] explored ridesharing within a university community based on a suburban area, demonstrating

the potential for carpooling initiatives among higher education communities. Their study suggested that institutional support and digital platforms could play vital roles in fostering carpool adoption. Similarly, Sandaruwan et al. [19] proposed carpooling as a solution to reduce congestion in Sri Lanka's urban centres, particularly Colombo and Kandy. They identified vehicle ownership patterns, travel behaviour, and public perception as key variables influencing carpooling feasibility.

2.5. Implications for this Study

This literature review highlights various factors influencing carpooling, including economic, behavioural, institutional, and technological aspects. While international studies provide insights into motivations and barriers, there is limited research on LMICs such as Sri Lanka, particularly regarding contextual factors such as vehicle type, which may influence participants in carpooling, where individuals often act as both suppliers and demanders. Existing studies on ridesharing offer useful insights, but they do not fully capture the unique dynamics of carpooling in Sri Lanka. Given the country's safety concerns, vehicle preferences, and income variations, further research is needed to assess how these factors influence carpooling adoption. By addressing this gap, this study aims to develop an understanding of the factors affecting vehicle owners as both demanders and suppliers in Sri Lanka, generating insights that can better inform policies and practices.

3. METHODOLOGY

This section details the research methodology by laying out its objectives and provides readers with a detailed understanding of the research design pursued in this study. It elaborates on the different methodological decisions made throughout the design and data collection stages and the underlying rationale for selecting one method over another. The key objective of this study was to identify the factors affecting carpooling in Sri Lanka, particularly how safety concerns, vehicle preferences, income variations, and the country's diverse commuting modes (e.g. cars, vans, and two- and three-wheelers) may shape vehicle owners' participation in carpooling. To achieve this objective, this study used a mixed methods approach (see Figure 1), employing both qualitative and quantitative approaches in the data gathering and processing, given the exploratory nature of the problem and the need to generalise. The qualitative phase assisted in designing the quantitative phase with the insights received from the in-depth interviews with different vehicle owners.

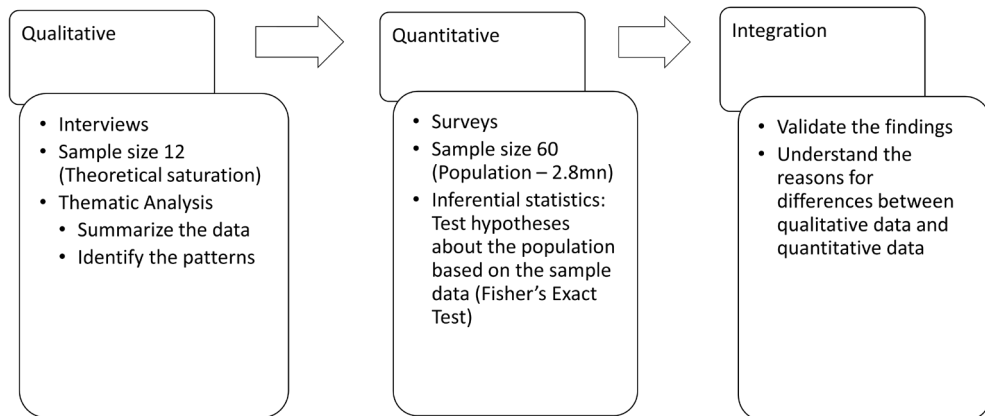


Figure 1: Illustration of the research design

3.1. Qualitative Data Collection

The interviewees for the qualitative data collection were selected based on convenience sampling, given the exploratory nature of this phase, and were included if they used the specific vehicle type (e.g. cars, vans, and two- and three-wheelers) relevant to the study design. Data collection was conducted from November 2023 to January 2024 and continued until data saturation was reached. Participants were selected using convenience sampling within a purposive framework from the Western Province, from the Western Province, chosen for its potential for carpooling based on commuting patterns and vehicle ownership characteristics. Given the study's focus on identifying the perspective of vehicle users as potential owners and users, participants were limited to individuals who regularly operated private vehicles. Accordingly, 12 individuals were interviewed (4 cars, 3 three-wheelers, 3 two-wheelers, and 2 vans) until thematic saturation was reached [20], [21], the point at which no new information or relationships among themes emerged. This decision was informed by the research team's prior experience with qualitative methods and supported by the existing literature on the concept of saturation. Although it would have been preferable to conduct more interviews, time and resource constraints outweighed the benefits of conducting additional interviews [21]. In-person, Zoom, and WhatsApp were used to gather insights according to the preferences of the interviewees. At the beginning of each interview, verbal consent was obtained from the participants. Because the interviews were semi-structured, important subjects were covered by leveraging flexibility. The recordings were transcribed verbatim to ensure accurate representation of the participants' responses. The transcripts were analysed using thematic analysis [22], which involved identifying, coding, and grouping recurrent themes across the interviews while acknowledging the researcher's active and subjective role in the interpretive process. For example, if

multiple interviewees expressed concerns about safety or convenience in relation to carpooling, these responses were categorised under themes such as perceived safety or travel flexibility. This approach facilitated a deeper understanding of the factors shaping participants' attitudes and decisions regarding carpooling.

3.2. Quantitative Data Collection

The survey instrument was developed based on insights derived from the qualitative phase of the study and supported by relevant literature, with the aim of enhancing content validity and enabling further exploration of key themes. The survey was administered using Google Forms, and a pilot test was conducted to identify and rectify any issues related to question clarity and survey flow. The survey was launched in March 2024 and ran until May 2024. Owing to scheduling constraints, a convenience sampling approach was adopted. In alignment with the qualitative sample, the survey targeted participants in the Western Province, selected for its potential for carpooling based on commuting patterns and vehicle ownership.

The final survey, which took approximately 10 minutes to complete, was distributed to approximately 125 individuals who met the criteria of using their own vehicles for regular commuting, of whom 60 completed the survey. In the qualitative phase, theoretical saturation was used to determine the sample size. Participants were provided with a link to a Google Form and encouraged to complete and share the survey within their networks. Written informed consent was obtained before the start of the survey. To ensure compliance with ethical standards, no identifiable information was collected, and built-in data protection measures were used throughout the data collection process.

The study's participants were predominantly from the 25–30 age group, which constituted 35% of the sample. The gender distribution was highly imbalanced, with only two female participants, partly due to the male dominance among drivers in Sri Lanka. Motorcycles were the most common mode of commuting, used by 51.5% of the participants, followed by cars (39.4%) and three-wheelers (9.1%).

3.3. Data Integration

Combining quantitative and qualitative datasets allowed for the identification of relationships and patterns across both, leading to a deeper understanding of the topic. This approach enabled the exploration of possible reasons for any differences between data types, such as how qualitative insights could explain variations in numerical outcomes. The integration process involved aligning recurring themes from qualitative interview transcripts with quantitative survey results and examining

how qualitative findings could offer explanations or context for the patterns found in the numerical data.

4. ANALYSIS AND RESULTS

The preliminary outcomes of the qualitative phase were used as inputs for the survey and to synthesise the quantitative outcomes. This section explains the analytical approach of the quantitative phase and its resulting outcomes. Furthermore, this also includes the findings of the qualitative phase.

4.1. Qualitative Findings

The thematic analysis of the qualitative phase revealed key insights into the factors influencing private vehicle operators' intention to adopt carpooling and shared mobility. The findings were categorised under three overarching themes: commute diversity and willingness to share, motivations and barriers, and anticipated future impacts. These themes reflect the complex interplay of personal, social, and structural factors shaping individuals' tendency to share extra space in their vehicles.

4.1.1. Commute Diversity and Willingness to Share

Participants reported diverse commuting patterns, ranging from short intra-city trips to longer suburban-to-urban commutes to work. While some participants expressed openness to carpooling, their willingness was conditional on factors such as route compatibility, reliability, and security. These concerns align with the existing literature, which highlights the importance of trust and convenience in facilitating shared mobility adoption [2], [5]. Moreover, participants who had previously engaged in informal carpooling arrangements tended to be more receptive to formalised carpooling schemes, suggesting that familiarity and prior experience play a role in shaping attitudes toward shared mobility.

4.1.2. Motivations and Barriers

Thematic analysis identified several key motivators and deterrents influencing participants' willingness to adopt carpooling and offer carpooling facilities to potential seekers. Cost savings have emerged as a significant driver, particularly for regular commuters seeking to reduce fuel and parking expenses. Environmental considerations, such as lowering carbon emissions and reducing urban congestion, were frequently mentioned as motivating factors. However, these motivations were often secondary to immediate personal benefits such as financial savings and convenience.

However, barriers to carpooling adoption were also evident. Safety concerns, particularly regarding travel with unfamiliar individuals, were recurring themes.

Participants expressed apprehension regarding personal security, reliability, and the potential for uncomfortable social interactions. Privacy concerns and a lack of control over travel schedules further discouraged some individuals from considering carpooling. These findings align with prior studies that highlight the lack of trust and perceived personal risk as major impediments to shared mobility adoption [2],[6]. Another prominent barrier was the rigid nature of carpooling arrangements. Participants voiced concerns over potential delays, the need for precise coordination, and the lack of flexibility compared to when their vehicles were used privately instead of pooling. In contrast, digital platforms that facilitate real-time matching and route adjustments are viewed as potential enablers of greater adoption. Some participants also noted that social incentives, such as travelling with colleagues or community members, could enhance trust and make carpooling more appealing.

4.1.3. Anticipated Future Impacts

Participants anticipated both personal and broader societal benefits from increased carpool adoption. Many expected a reduction in personal vehicle use, potentially leading to lower transportation costs and improved urban mobility in the future. Several participants viewed carpooling as a viable long-term strategy for alleviating traffic congestion, reducing travel stress, and enhancing overall commuting experiences. These perspectives align with research indicating that shared mobility can contribute to a more efficient use of road infrastructure and a decreased dependency on single-occupancy vehicles. Additionally, social benefits were frequently mentioned, with participants highlighting the potential for strengthened community ties and improved social interactions through shared travel experiences to be created. Some researchers have anticipated that increased carpooling could positively influence urban transport policies, encouraging investments in dedicated carpool lanes and supportive infrastructure.

Overall, the thematic analysis underscores the multifaceted nature of carpooling adoption, revealing the complex balance between perceived benefits and challenges. Addressing barriers, particularly concerns regarding safety, flexibility, and trust, is essential to increasing participation in shared mobility solutions. These findings provide valuable insights for policymakers and service providers seeking to enhance carpooling initiatives and promote sustainable urban transportation options.

4.2. Quantitative Findings

This section presents the demographic details of the participants and explains the interrelationships between selected variables. remains an unfamiliar concept for most participants, with only 15% reporting prior experience with carpooling or ridesharing. The remaining 85% had never used these services, indicating a potential barrier to

adoption and underscoring the need for increased awareness and engagement with carpooling. Nevertheless, 86.7% believed that carpooling could significantly reduce traffic congestion, while 13.3% were sceptically about its effectiveness. These perceptions reflect optimism regarding carpooling's potential as a sustainable solution to urban mobility challenges.

Figure 2 illustrates the importance of various vehicle-related factors when considering carpooling. The chart shows the percentage of participants who ranked each attribute as their 1st or 2nd priority on the left, 3rd priority in the middle, and 4th or 5th priority on the right. The respondents placed the highest importance on fuel efficiency (58%) and vehicle size (37%), showing a strong preference for economical and spacious travel. Air conditioning and vehicle type were considered the most important by 35% of respondents, while vehicle condition (30%) was of moderate importance. Figure 3 illustrates the various motivations for carpooling. The percentages on the left-hand side represent the 1st and 2nd rankings, while those on the right-hand side correspond to the 3rd and 4th rankings. Accordingly, cost savings (75%) clearly emerged as the dominant driver of carpooling willingness, followed by privacy (57%), ensured security (40%), and passenger information (28%). These results suggest that although vehicle-related practicality is central to decision-making, financial savings and personal comfort are the most compelling motivators for adopting shared mobility solutions.

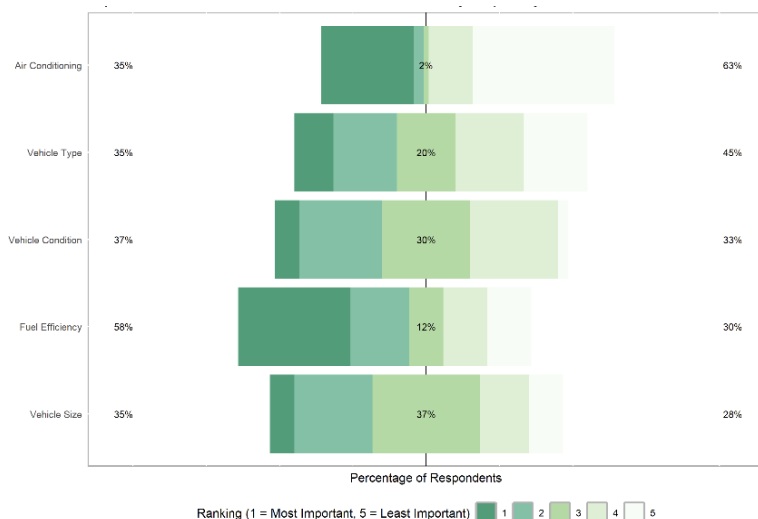


Figure 2: Ranking of vehicle-related factors related to carpooling

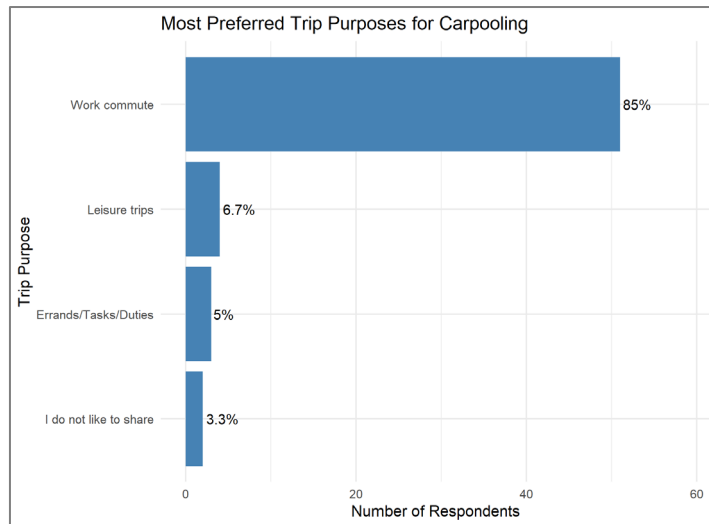


Figure 3: Ranking of enablers related to carpooling

As shown in Figure 4, work commutes were the dominant purpose for carpooling, with 85% of participants indicating a willingness to share their vehicle for this reason, highlighting commuting as the most practical and accepted context for shared mobility. As indicated in Figure 5, the most valued carpooling app features were assured matches (78.3%), safety features (75%), and user ratings and reviews (53.3%), reflecting a strong emphasis on trustworthiness and reliability. Other preferences, such as reward systems and cost-sharing tools, were mentioned less frequently, suggesting that they are secondary to core functionality when it comes to app adoption.

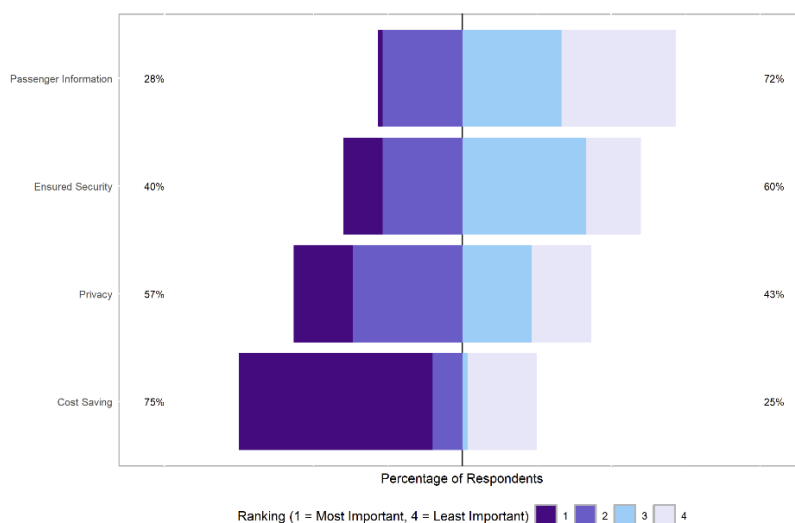


Figure 4: Most preferred trip purposes for carpooling

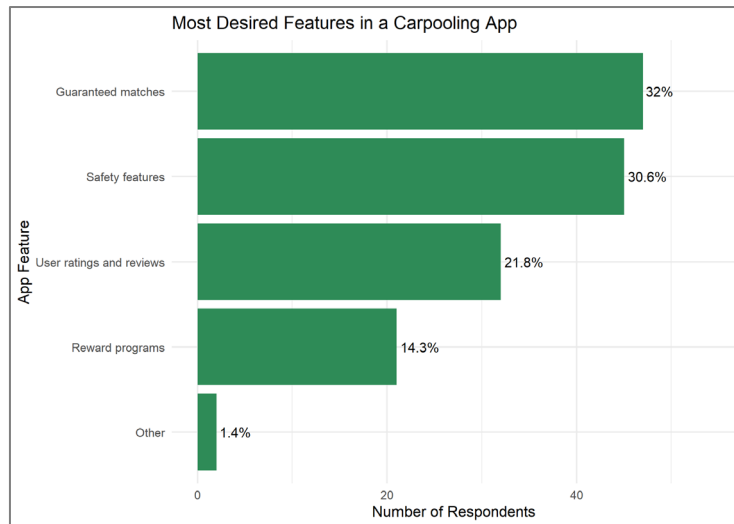


Figure 5: Most desired features in a carpooling app

4.2.1. Impact from Different Variables

The analysis focused on the vehicle user's willingness to share empty vehicle space under varying circumstances. The following hypotheses were tested to gain a firm understanding of the areas that the study focused on. Fisher's exact test was used for statistical analysis because of the limitations of a small sample size and specific factors with fewer than five responses. Low cell frequencies or small sample sizes can cause traditional chi-square tests to produce incorrect findings. Fisher's exact test is recommended in such scenarios to improve accuracy. Researchers ensured stability in data analysis despite the restricted availability of data in some categories by using Fisher's exact test to precisely measure the significance of the relationships between categorical variables.

- H_0 - There is no significant relationship between [particular factor of owners] and willingness to share empty passenger space.
- H_1 - There is a significant relationship between [particular factor of owners] and willingness to share empty passenger space.

Age

To assess the association between age and willingness to carpool, responses to the statement "I would like to share my empty vehicle space with others" were categorised into two groups: "Agree", which included Strongly Agree, Agree, and Neutral responses, and "Disagree", which combined Disagree and Strongly Disagree. Neutral responses were included with agreement to reflect passive openness or non-opposition to carpooling, recognising that such individuals may be more amenable to future behavioural changes. Using this classification, a Fisher's Exact Test comparing

individuals aged 25–35 years with all other age groups yielded a statistically significant association ($p = 0.026$), indicating that respondents in the 25–35 age range were more likely to express willingness, either actively or passively, to share their vehicle space.

Types of Vehicles

The study participants utilised diverse forms of transportation for their daily work commute, with some alternating between different modes, such as riding a motorcycle on some days and driving a car on others. Motorcycles were the most common choice, used by 51.5% of the participants. Four-wheelers, including minivans, hatchbacks, and sedans, were used by 39.4% of the participants, while 9.1% relied on three-wheelers. The majority of respondents (80%) believed that some vehicle types are better suited for carpooling than others, while only one individual disagreed, and approximately 18% remained neutral. Although this question did not specify or prioritise particular vehicle types, the strong agreement suggests a shared perception that design- and capacity-related factors (e.g. comfort or space in cars or vans versus motorbikes) may influence carpooling suitability. These findings highlight the flexibility of commuting choices, reflecting individual needs and preferences.

Contingency tables were used to assess the relationship between vehicle type (Motorbike, 3-Wheeler, and 4-Wheeler) and willingness to share unoccupied space in their vehicles with others, using only the extreme responses (“Strongly Agree” and “Strongly Disagree”). Although a greater proportion of motorbike users (29 out of 34) expressed a strong willingness to carpool compared to users of 3-wheelers and 4-wheelers, the chi-square test yielded a non-significant result ($\chi^2 = 0.217$, $p = 0.897$). This suggests that the observed variation in willingness across vehicle types is not statistically significant and could be due to random chance. Therefore, while the data show a trend, particularly higher openness among motorbike users, it does not provide strong enough evidence to confirm a reliable association between vehicle type and willingness to carpool.

Travel Distance

To assess whether commuting distance influenced the willingness to share space in private vehicles, participants were initially categorised by distance: less than 6 km, 6–12 km, 13–19 km, 20–26 km, and more than 26 km. Agreement rates (including Agree, Neutral, and Strongly Agree) were generally high across categories: 83.3% for those travelling less than 6 km, 85.2% for 6–12 km, 90.0% for 13–19 km, and 50.0% for 20–26 km. Notably, participants commuting more than 26 km showed 100% agreement with carpooling, indicating a strong willingness among those with

the longest commutes. For analysis, these categories were grouped into two: ≤ 12 km and >12 km. In the ≤ 12 km group, 90.5% expressed willingness (38 of 42), compared with 85.7% in the >12 km group (12 of 14). However, Fisher's Exact Test yielded a p-value of 1.0, indicating no statistically significant association between commuting distance and willingness to carpool.

Distance to Access Public Transportation

The study participants stated that they lived in different places using public transportation. Of the respondents, 28% lived within 1 km of public transportation access points, whereas 60% reported residing 1–3 km away. Only 1.7% lived at a distance of 4–6 km, and 10% reported living more than 6 km from public transportation. While respondents who lived 1–3 km from public transport showed high agreement toward carpooling, statistical analysis using the chi-square test ($\chi^2 = 8.09$, $p = 0.232$) revealed no significant association between proximity to public transport and willingness to share vehicle space. Even after merging neutral responses with agreement categories, the results remained non-significant ($p = 0.957$). Similarly, for general travel distances, no statistically significant relationship was found ($\chi^2 = 2.69$, $p = 0.611$), despite a higher carpooling interest among those commuting longer distances. These findings suggest that while distance may influence perceptions, it is not a strong, standalone predictor of carpooling willingness in this sample.

5. DISCUSSION

In summary, the findings highlight both the opportunities and challenges of promoting carpooling within the studied context. While carpooling remains unfamiliar to most participants, with only 15% having prior experience, there is clear optimism about its potential, with 86.7% believing it could reduce traffic congestion. Practical considerations such as fuel efficiency, vehicle size, and air conditioning were prioritised when evaluating vehicle suitability, while cost savings (75%) and privacy (57%) emerged as key motivations, aligning well with the extant literature in developing countries [9], [14], [18]. Work commutes (85%) were identified as the most likely trip type for carpooling, although this does not align well with the findings related to carpooling in developed countries, such as [7] which indicates a higher preference for leisure and shopping trips for carpooling among French drivers. Participants expressed a strong interest in app features that enhance trust and safety, such as assured matches, safety features, and user ratings, conforming with the findings of [16].

The study tested multiple hypotheses, with statistical analysis consistently rejecting the null hypothesis in favour of strong associations between key variables and carpooling propensity. Age emerged as a critical factor, with participants aged 25–35 years showing greater openness to sharing vehicle space. This group likely balances youthful adaptability with a degree of professional and financial stability, making them both familiar with shared mobility concepts and motivated by cost-saving and practical considerations. These findings suggest that individuals in the 25–35 age range represent a particularly receptive audience for carpooling initiatives, given their readiness to adopt new and efficient transportation solutions. To engage this demographic effectively, targeted policies could include partnerships with workplaces to promote carpooling, the use of simple app-based matching platforms, and incentives such as fuel discounts and mobile data rewards. Social media campaigns highlighting the economic and environmental benefits of carpooling can appeal to this tech-savvy and cost-conscious group.

Vehicle type appeared to influence carpooling attitudes, with a higher proportion of motorbike users expressing a strong willingness to share vehicle space. However, statistical analysis showed no significant association between vehicle type and willingness to carpool. Despite their popularity as a commuting mode, motorcycles are inherently limited in capacity, making four-wheelers more practically suited for carpooling. This highlights the importance of vehicle-related characteristics, such as size, comfort, and perceived privacy, in shaping commuter attitudes toward shared mobility. Proximity to public transport and overall travel distance did not show a statistically significant influence on carpooling willingness, despite higher agreement rates among moderate- and long-distance commuters. This suggests that distance alone may not be a decisive factor in shaping shared mobility preferences.

While participants with longer commuting distances appeared more open to carpooling in raw numbers, statistical tests (both Chi-square and Fisher's Exact Test) revealed no significant association between travel distance and willingness to share vehicle space ($p = 1.0$). This suggests that although long-distance commuters may be a promising target group for carpooling initiatives, the current data do not provide strong enough evidence to confirm this relationship. Future studies with larger and more diverse samples should explore this potential more robustly. Despite the lack of statistical significance, the unanimous agreement among the longest-distance commuters suggests that they may represent a particularly receptive group for targeted carpooling initiatives. These findings reinforce the need for targeted awareness campaigns and incentive-driven strategies to promote carpooling, particularly by addressing key demographic groups, improving accessibility, and integrating shared mobility into multimodal transportation networks.

The findings also show that respondents used a variety of vehicles for their everyday commute to work, including motorcycles, three-wheelers, and four-wheelers (cars and minivans). However, when it comes to carpooling, commuters prefer more comfortable and spacious seats with improved safety, tending to choose either four-wheelers or three-wheelers. The reliance on three-wheelers is also due to their affordability and accessibility for those with low incomes or who live in places with inadequate road systems. However, participants' choices are also influenced by issues such as safety, regulation compliance, cleanliness, and hygiene, highlighting the complex nature of their decision-making process. Hence, the sustainability of carpooling systems in the future depends on ethical factors such as passenger safety and environmental impact. Overall, this study offers insightful information about the variables influencing carpooling attitudes and behaviours in developing countries such as Sri Lanka, which can help shape the creation of successful programs and policies that support environmentally friendly transportation options.

Furthermore, the government can provide incentives to motivate more people to participate in carpooling. This can be in the form of tax advantages or subsidies for carpoolers, special parking for cars in the carpool, or incentive schemes for regular participants, as suggested in the extant literature [13]. It is important to note that effective government incentives for carpooling depend on the ability to accurately identify and verify participants. This can be achieved through features integrated into carpooling platforms, such as GPS-based ride tracking, digital check-ins, and trip logs that confirm completed journeys [1], [16]. Collaboration with employers, educational institutions, and transport providers can also support verification by maintaining participation records. These mechanisms help ensure transparency and enable the targeted and accountable distribution of incentives. This experience can be further improved through user design and experience, adding security measures, and incorporating more services, such as travel planning and payment choices. It is also important to take steps to address safety concerns associated with carpooling by implementing policies, including background checks on participants, offering safety instructions, and encouraging safe driving among carpoolers. Encourage employees to carpool by collaborating with companies to provide benefits, including company-sponsored carpooling programs, flexible work hours to accommodate carpooling schedules, and subsidised parking for carpool vehicles.

6. CONCLUSION

This study aimed to examine the willingness of vehicle users, especially those who commute to work in Sri Lanka, to share their empty vehicle spaces. This study aims to shed light on the dynamics of carpooling adoption in the context of LMIC's

transportation environment by identifying the important elements impacting drivers' willingness to carpool, such as the importance of vehicle type, individual characteristics such as age and stability, and preferences. The findings revealed that while carpooling remained unfamiliar to most participants, there was strong optimism about its potential to reduce traffic congestion. Respondents prioritised vehicle efficiency, size, and comfort, and were motivated primarily by cost savings and personal security. Commuting for work was the dominant purpose for carpooling, and digital app features such as assured matches and safety protocols were seen as essential for adoption.

This study underscores the multifaceted nature of carpooling preferences and behaviours in a developing country context, revealing that demographic factors, particularly age, and vehicle characteristics play a more decisive role than proximity to public transport or travel distance. While individuals aged 25 to 35 years emerged as the most receptive demographic, vehicle comfort, size, and safety also strongly influenced the willingness to share rides. Despite some encouraging trends, such as high willingness among motorbike users and longer-distance commuters, statistical analyses did not confirm these associations as significant, indicating the need for further research. Importantly, the preference for four- and three-wheelers for carpooling reflects practical considerations such as affordability, road access, and perceived safety. As such, sustainable carpooling strategies must go beyond infrastructure to address ethical and experiential factors, including passenger security, hygiene, and regulation enforcement. These insights can guide targeted interventions and policy reforms aimed at integrating carpooling into Sri Lanka's broader mobility ecosystem, fostering inclusive and environmentally responsible transport solutions. Governmental and institutional support, such as tax incentives, subsidies, dedicated carpool parking, and corporate partnerships, can play a significant role in promoting carpooling. Collaborating with carpooling platform developers to improve usability, security, and service integration is also critical, as highlighted in previous studies. In addition, implementing safety measures, such as participant screening and driver education, and encouraging employer-supported programs can further encourage adoption.

This study was conducted in Sri Lanka, which may limit the generalisability of the findings to other countries. Cultural and infrastructural differences should be considered when applying these insights. Additionally, while the sample provided useful insights, it was relatively small and skewed toward younger participants, particularly those aged 25–35 years. This demographic bias may have influenced the findings related to openness to carpooling and shared mobility. The sample size was another limitation, although this was addressed to a certain extent using customised

statistical tests. Although this study assessed individual variables, real-world decision-making often involves the interaction of multiple factors. Owing to the current data limitations, multivariate analysis could not be conducted. However, future research should employ such methods to evaluate the combined and interacting effects of key variables on carpooling behaviour. Moreover, the study focused on private vehicle users and did not include individuals who rely on public transport or other modes of travel, which may have limited the diversity of perspectives. Future studies should aim to recruit larger and more age-diverse samples using a stratified sampling approach to ensure representation across key user groups, including those who use public transport or alternative travel modes, to support broader applicability and a more comprehensive understanding of carpooling behaviour.

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