Sahayatri Carpool System in Nepal

Shadip Kumar Joshi

B.Sc. (Hons.) Computing, Softwarica College of IT and E-commerce, Coventry University

STA103IAE Creative Thinking for Business

Arun Phuyal

January 20, 2023

Executive Summary

In the history of human civilization, mankind has experienced many milestones that had made our present life possible. Some of these instances were the first discovery of fire, the starting of agriculture, the development of language, industrial development, medical development, the computer age, and so on. Among all these milestones, the transportation system has played a major vital role in developing all the milestones in some way or another, either for transporting items or for travel purposes. Its existence can be seen in the earliest times as wooden carts that were pulled by animals like horses, donkeys, and bulls. As times changed, with technological development numerous inventions revolutionized the transportation system through the invention of cars, buses, trucks, spacecraft, helicopters, ships, airplanes, etc taking the place of earlier transports.

The transportation system has undeniably uplifted human lifestyle. However, it has also negatively affected humanity. It is widely recognized that people's over-reliance on transportation contributes to many environmental problems, especially in urban areas. Traffic congestion has caused many simple rides to be uncomfortable. This has also impacted people's health in a negative way both physically and mentally. Many people lose their life, are hospitalized, or are disabled almost daily due to accidents in Nepal and also all over the world.

This paper is dedicated to the introduction of shared mobility i.e. carpooling as a sustainable solution to traffic problems prevalent in Nepal through brainstorming and PESTLE analysis. Sustainable mobility is an answer for a better experience of transportation and an important dimension of a Smart City. Shared vehicle mobility services are part of sustainable mobility and they are widening their portfolio in many foreign nations like China, European countries, India, USA, Australia, etc especially in the past decade. However, this concept is still alien for the Nepalese community. This paper intends to explain the advantages of ride-sharing system, explain its high potential, and innovative service to the public and increase their participation in carpooling through the combination of increasing the awareness of citizens, incentivizing them, and promoting their behavioural change.

Acknowledgement

"No one who achieves success does so without acknowledging the help of others. The wise and confident acknowledge this help with gratitude." - Alfred North Whitehead (*Alfred North Whitehead Quotes*, n.d.).

I would like to express my deepest gratitude to my module leader Arun Phuyal for his invaluable teachings, instructions and feedback, and Softwarica College for the opportunity to perform this project. I also could not have undertaken this journey without my friend Krishna Shrestha, who generously provided his knowledge and expertise. Additionally, this endeavour would not have been possible without the generous support from the stakeholders.

I am also grateful to my classmates and seniors for their proofreading, late-night feedback sessions, and moral support. Thank you should also go to the librarian and study participants of Softwarica college, who impacted and inspired me.

Lastly, I feel that I must mention my parents and siblings for their belief in me that kept my spirits and motivation high during this process. Last but not the least, a "Thank you" should go to my favourite web novelist Awespec for all the entertainment and open-mindedness motivation through his mind-blogging web novel "Dimensional Descent".

Table of Contents

Table of Figures

Introduction

Transportation system is a means of conveyance or travel form one point to another point for the convenience of people to save time and effort. It is especially helpful for physically disabled people, elderly, patients and pregnant women. Socio-economic development, trade, import and export, business and education, food and petroleum transportation, and so on are directly dependent upon means of transportation. A good transport system is a benchmark of development. For this very reason, all countries assign a large amount of budget for road and transportation every year. Though transport system has their own merits, they are overshadowed by problems caused by their improper maintenance and lack of development. These problems are caused by the vehicles themselves, or the roads on which vehicles drive or by the people themselves.

"Carpool System" is a mobile, desktop and web application that centralizes all adverts from possible carpoolers in Nepal. Carpoolers are automobile owners who have an extra free seat(s) in their vehicle till their destination and wish to avail it to the willing co-traveller (s) for a part or complete journey. Carpool is also referred to by terms such as carpooling, car-sharing, ride-sharing and lift-sharing. Through this software, verified registered drivers can post a carpool and registered users can book a seat in the available carpools for any available date for the journey. This simple and user-friendly software facilitates a platform for drivers and riders to connect and interact with each other to share a ride shouldering the travel expense together. Carpool is one among many solutions to curb problems in the current transportation system in Nepal as well as problems caused by the present transportation system in Nepal. Figure 1 shows a driver sharing his ride with others.

Figure 1

Carpool system (Freepik, 2019).

Creative Thinking Process

Solutions to the problems of transportation system in Nepal is found through *"Creative Thinking Process"*

Defining a Problem

The problems concerning transport system in Nepal is defined though observation and engagement with the associated stakeholders.

Problem Statement

➢ **Traffic Movement and Congestion:** Traffic congestion occurs when transport networks cannot accommodate the volume of vehicles using them. According to the Department of Transport Management (DoTM) in 2016/17, Bagmati province has 119,956 vehicle registrations which includes 1,405 buses, 2,132 minibuses, 14,542 cars and jeeps, 222 microbuses and 94,751 motorcycles *(Department of Transport Management, n.d.)*. The 27 km long eight-lane Ring Road suffers traffic-jams at peak hours on a daily basis. Such roadblocks are also common in narrow city streets.

➢ **Public Transport Crowding**

Public transports are over-crowded with passengers. Drivers and conductors try to fit more people in public vehicles even though they have already reached their allotted load-capacity.

➢ **Uncomfortable Ride**

Due to overpacking in vehicles, commuters have to stand on the aisle. Many times, people's personal space is encroached upon and they have to travel uncomfortably by sticking with strangers. Pregnant women, elderly people and disabled face major uncomfortableness in such rides. Overcrowding also causes suffocating riding environment especially in summer.

➢ **Limited Transportation Coverage**

Public transport and ride-hailing services are normally limited within a particular area, while ticket booking system is focused on popular intercity connections.

➢ **Molesting issues**

Many passengers suffer molesting and personal space encroachment by other passengers. This case is regular for females travelling in vehicles that are packed.

➢ **Expensive Transportation System**

The cost of the travel is fixed and usually expensive especially in festival times like in Dashain.

➢ **Not eco-friendly**

Pre-existing services impacts the environment negatively and are the main causes of air pollution and noise pollution.

➢ **Not Punctual**

Public vehicles rarely move on time. They move only when the vehicles have enough customers. If the driver determine that not enough people are on board, they wait for more passengers to join and hence they waste valuable time of already boarded passengers. The bus driver is thereby late in another stop. There is no timetable for public rides at all, even if it exists it is totally ignored.

➢ **Pickpockets and Insecurity**

Crowded public vehicles are the favourite hub for pickpockets. In case of lost baggage, passengers don't have the number of drivers to contact.

➢ **No credibility**

Public transportation may or may not be creditable. They lack user evaluation and the co- travellers are neither riders nor drivers' choice. Many people use public transportation because they don't have other alternatives.

Figure 2

Problem statement of current transport system

Stakeholders of the Problem Statement

➢ **Local Residents (Students, Office workers, elderly)**

The main purpose of public transportation is to provide transportation service to the residents. Residents cover people of all age groups and races. Students normally use public transportation service to travel to-and-fro from their academic institutions to their residence. They also enjoy student discounts in many public vehicles with the presentation of valid student card to the conductor. Many office workers commune back and forth from their office to home through public transportation services. Many other locals like elderly, patients, ladies, etc implements the usage of publicly available means of transportation for their respective travel purposes.

➢ **Tourists**

Foreigner who visits Nepal for the purposes of vacation, sight-seeing, sports immersion, business, safari, mountain climbing, festivals, cultural experience and so on utilize public vehicles to reach their visit-destinations. It is common to find foreigners in local buses enroute to tourist hotspots like Bhaktapur Durbar Square, Patan Durbar Square, Kathmandu Durba Square, Pasupatinath, Swayambhunath Stupa, etc. Many foreign youtube vloggers even post their public rides experience in Nepal in social medias like Facebook, YouTube, Instagram, blogs, Snapchat and so on. Internal tourists, the people who travel within the country for tourism purpose, also ride on public transports for commuting purposes.

➢ **Drivers, Conductors**

Every vehicle needs a driver to run the vehicle. Although many developed countries have already introduced automated public transportation systems. In Nepal, at present all public vehicles are driven by licensed drivers. Conductors (clippies) manage the fare collection department. They are also responsible of informing the passengers of the vehicle's destinations and stops, and picking up people and onboarding people when they reach their destination.

➢ Vehicle Owners

In Nepal, vehicle owners can be either organisations or people. One prominent organisationally run public transportations in Nepal is Sajha Yatayat. Many people also own their own private vehicles like microbus, bus, taxies, rickshaw, Pathao (ride-hiring system) and so on to provide transportation services to public. Privately owned travel services like Nepal Yatayat, Agni Yatayat, etc is also common in Nepal.

Identify questions

1.   Do driver and conductor enjoy their job?

2.   Why do users use public vehicles?

3.   What kind of public rides do user use?

4.   Do users prefer public transportation or private transportation?

5.   Why do users prefer public transportation or private transportation?

6.   Is public transportation comfortable in Nepal?

7.   Is public transportation punctual in Nepal?

8.   Is public transportation secure in Nepal?

9.   Do drivers or riders experience traffic jams?

10. How often do riders or drivers experience traffic jams?

11. What could be the causes of traffic jams?

12. How can the problem of traffic jams be solved in Nepal?

13. What are the problems in public transportation?

14. What kind of problems does public transportation causes?

15. Do users think public rides are worth their fares?

16. Do users get discounts or offers in public rides?

17. Are public transportation fares flexible?

18. Are there sufficient seats for passengers?

19. Are public vehicles available for all areas of a user's travel?

20. Do public vehicles drop passengers at their destination?

21. Do passengers have to make transits in their travel?

22. Are public rides available in even narrower lane?

23. How is travel in small roads conducted?

24. Do pedestrians have enough space to walk on road?

25. Is footpath available in all streets in Nepal?

26. Do pedestrians obstruct public vehicles in their travel?

27. What is the condition of traffic outside of the Kathmandu Valley?

28. Do drivers or riders face complications in public rides in festive times?

29. What are the impacts of inflation in petroleum fuels in public transportation?

30. As a local resident, what could be the solutions for problems in public transportation?

31. Do citizens think Nepal can solve traffic problems by itself?

32. Do Nepal have to depend on foreign nations for traffic solution?

33. As a driver/vehicle owner/conductor, what could be the solutions for problems in public transportation?

34. What do tourists think are the differences between public transport in your country and Nepal?

35. What do tourists think could be the solutions for problems in public transportation?

Stakeholder Benefits

All the stakeholders will benefit from the solutions. With the proper implementation of the solutions, all the riders can enjoy a traffic congestion-free ride on every street of Nepal. Such traffic-jam-free ride implies lesser stress for drivers, riders, pedestrians and traffic police. Lesser stress furthers signifies better mental health in the locals. All the public vehicles will be punctual in time with comfortable ride with better security against theft, molesting and personal space encroachment. Elderly, ladies, pregnant women, physically impaired people, patients and children can make use of allocated seats to them. Unbearable loud sounds of horns are common in traffic jams in comparison to normal traffic. Hence reduction in traffic congestion implies lesser noises of vehicle's honking which results is a welcoming matter for all people.

Bus stations will be available in many presently unreached areas, thereby benefitting locals of those areas as they do not need to walk long distances to reach bus stops. Properly managed transportation system with introduction of newer and greener means of transports like electric cars, e-scooters, solar vehicles, electric street trams, trolley bus and cable cars also signify economical usage of petroleum fuels, lesser emission of exhaust gases like CO2 and other greenhouse gases. This further helps to government to save money in import of petroleum fuels. This saved capital can be made of good use in other developmental aspects by the government for the welfare of the public.

According to some news in "The Himalayan Times", about 200,000 students ride 6,000 school buses making 2-6 trips a day or around 30,000 trips, forcing the students to spend about two hours every day on the bus alone, apart from at least six hours in school *(Singh, 2022)*. With proper management and security-enhanced public transportation, school students can ride on public vehicles with easy heart and reduce the roundabout travel route to a straightforward and quick route between home and school and spend less time on vehicles.

Research Solutions

The government of Nepal has received many foreign aids in road development in the course of history. In 1975, the People's Republic of China gifted Nepal trolley buses to run within Kathmandu valley to provide cheap transport services to the Nepalese people. It was the only trolley bus system constructed in Nepal's history and was under operation till late November 2008 *(Wikipedia contributors, 2021)*. In 2018 with the assistance of China, a 800 meter long underpass at Kalanki was constructed as Phase 1 of Kathmandu Ringroad Expansion Project to remove long traffic jams at the main entry point of the valley. It is the first underpass built in Nepal. The traffic police claim that the traffic jam at Kalanki has been reduced by 80 percent thanks to this underpass. The Ring Road expansion drive commenced with an aid of Chinese Yuan 512 million (approx. Rs 5 billion). As per the project, 10.5 kilometres stretch of Ring Road from Kalanki to Koteshwor will be upgraded to 10 lanes including a footpath and a cycle track alongside the road. This road section is speculated to have three overhead bridges and four bridges over rivers. Additionally, the Ringroad was also built with the aid of Chinese government and opened to traffic in February 1977 *(Project | china.aiddata.org, n.d.).*

Nepal has a total of four cable cars in operation till date. The cable cars are used for easy and quick transport to either religious hill stations or sunrise-viewpoint. These electric run cable car covers 5-6 hour of route in around 10-15 minutes. Manakamana cable car is the first of its kind in Nepal and was inaugurated on November 24, 1998, by the then Prince Dipendra Bir Bikram Shah Dev. Chandragiri cable car was opened officially in 2016 and Kalinchowk cable car came into operation in November, 2018. The latest addition of cable car is Annapurna cable car, which connects Fewa lake to Sarangkot in Pokhara, was launched in February of 2022 *(Cable Cars in Nepal – Boss Nepal, n.d.)*. These cable cars have assisted in reducing the cost of travel and fuels combustion by wheeled vehicles and shortening the travel time.

Mr. Kulman Ghising, managing director of Nepal Electricity Association, has suggested to remove the private cars from the busy road during office hours and to allow

odd and even number vehicles on the road each day to mitigate traffic jams. He confirms that a provision has also been made to set up a public electric vehicle charging station on public land with the approval of the government *(Poudel, 2022).* A suggestion of reducing the number of private vehicles, especially motorcycles and scooters, inside the Ring Road of Kathmandu to control traffic jams is also being circulated in media. The government has also proposed about constructing an underpass at New Baneshwor and a flyover on the Maitighar-Thapathali section, but they still have not been realised.

In the month of September of 2022, the 15th mayor of Kathmandu, Mayor Balendra Shah has focused on strictly monitoring and vacating the basement parking in commercial buildings which they are illegally using for other purposes and demolishing illegal constructions and structures that are encroaching public space along footpaths. He is also clearing the footpaths of hawker shops, unorganised parking and managing teams for lookouts so that public can use the footpaths for its intended purpose of safe walks. This has reduced people walking in vehicle lane and thus reducing traffic jams.

Many areas of historic importance have been declared as vehicle-free zone in Nepal. In 2010, the Kathmandu Metropolitan City (KMC) banned vehicles except for emergency vehicles like ambulances inside the Durbar Square, which has been listed as UNESCO World Heritage site, taking inspiration from historic cities in Europe *(Khanal, 2014).* In 2011 similar steps were taken to enforce no-vehicle rule in Bhaktapur Durbar Square, an ancient town in Bhaktapur *(Shrestha, 2018)*. The main tourist hub of Kathmandu, Thamel was declared vehicle-free zone on October 22, 2017 and the market area Ason-Indrachowk had four-wheeler ban in January 16, 2018. The same rule was also implemented in Patan Durbar Square in 2018 *(Setopati, 2018)*.

Heavy-duty cargo vehicles like 10-wheeler or multi-axle trailer are banned from entering or leaving the valley in Nepal and must remain off-road from 8 am to 7 pm except for vehicles ferrying milk, water, chicken, petroleum products, and vegetables *(Onlinekhabar, 2019).* Similarly, DoTM has imposed a ban on 20-year-old public vehicles

in Nepal from March of 2018 *(Himalayan News Service, 2017).* Old vehicles has been proved to be major cause of air pollution and traffic congestion.

On September 2017 in Washington DC, the then finance minister on behalf of Nepali Congress-Maoist coalition government signed the Millennium Challenge Corporation (MCC) Agreement under the US government's Indo-Pacific Strategy Pact for its $500 million grant investment for an additional $130 million at Nepal's counterpart. Nepal's parliament ratified this MCC compact on 27 February 2022. One of this compact's component is road upgradation. According to its pilot program, a 40-km section of the East-West Highway, from Shivakhola to Dhankhola in Dang district, will be upgraded adopting latest technology. Based on the success and experience of this pilot program, the road project could be expanded to the periodic maintenance of up to 305 kilometers of the country's strategic road network *(Nepal Compact, 2022)* *(Wikipedia contributors, 2022)*.

Foreign countries have also made great efforts in handling traffic problems. One implemented solution to traffic congestion is smart mobility. Smart mobility is a new concept of connecting a city's transportation system to the cloud. Digital information of each element like vehicles, traffic signals, people, roads, and maps are digitally collected, combined, and analysed to optimize the flow of vehicles in the city. *This Internet of Thing* (IoT) approach is being implemented in cities of Hongkong, Taipei, Helsinki (Finland), Barcelona, London, Moscow, Seoul, Hamburg, Iwata (Japan), Mumbai, etc. They are using different software of traffic monitoring system like ARTEMI *(Kim, 2022).* Microsoft is collaborating with companies like Moovit and TomTom to offer real-time data to *Mobility as a Service* (MaaS) application providers *(Jacob, 2020).* The vision of MaaS is simplification and reduction in expense for car drivers and passengers to travel via alternative forms of transportation. It enables travellers to plan trips based on their priorities and preferences.

Bicycle commuting, car sharing, on-demand ride service and integration of all transportation is also being supported in foreign countries. Countries like Germany,

Poland, China and other European countries have cheap smart bicycle hiring services through smartphone scanning in their highly populated cities to motivate locals to use them instead of vehicles. Stockholm's has electronic road pricing scheme that charges motorists for entering the central city on weekdays, between 06.30 and 18.30. Copenhagen's Integrative Public Transport Model has integrated all kinds of local transports like buses, trams, trains, etc to form a network where a single timed ticket can use all the available services within the specified time *(Wong, 2014)*.

Electric trams and electric vehicles like Tesla with lower emission of CO_2 are also in hype these days in many nations. E-scooters are common in old towns in many countries. Many countries have multi-storeyed parking buildings to overcome unnecessary, unmanaged and illegal parking on the roadside.

Carpools like Blablacar in Europe, Waze Rider and RYDE in US are also popular in many foreign nations. Carpools help to share ride cost, fuel usage and traffic jam reduction. Carpooling was heavily promoted in major US cities after World War II to counter a severe fuel supply crisis and conserve gasoline for the war. At that time, to encourage the idea, posters stating 'When You Ride Alone, You Ride with Hitler' were hung everywhere as shown in figure 3 *(Pursell, 1943)*. During the blockade in the winter of 2015/16, a Facebook group named "Carpool Kathmandu" was initiated to solve transport problem at the time of fuel shortage from local initiative with three rules as: #ASK - If you need a ride, #OFFER - If you have a ride to offer, and #FILLED - Once the capacity is filled, you need to edit your hashtag to #FILLED *(Taylor, 2018)*.

Figure 3

"When You Ride ALONE You Ride with Hitler!"- a propaganda by US Government Printing Office for the Office of Price Administration, NARA Still Picture Branch (NWDNS-188-PP-42) (Pursell, 1943).

Assumptions about problem statements and questions raised

➢ In Nepal, drivers and conductors don't enjoy their job since this job needs them to work from dawn to dusk the whole week without less to none off day. This job is also considered lower-level job in Nepal. Many drivers and conductors are mostly uneducated or with very minimal education, and they are discriminated upon by locals.

➢ Local residents normally use public transportation like bus, micro, tempo, taxi, etc and ride hiring systems like pathao. Rich people normally ride their own motorcycles or cars. Students usually prefer to ride on school bus. College students prefer to use bikes for transportation.

➢ People that can afford tend to use private vehicles more, because its usage capability is related to their socio-economic prestige.

➢ Public transportation like bus, micro, tempo and rickshaw are old and not comfortable, while taxis and pathao are comfortable.

➢ Public transportations are rarely punctual and secure in Nepal.

➢ Traffic jam is a regular occurrence in Nepal. Though it has been mitigated due to various government efforts, it still hasn't gone bellow the acceptable level.

➢ It is common to experience traffic jams in rush hour every day. Only in big festivals like Dashain or in restricted days like strikes, election day, pandemic, etc are there lesser traffic on roads with no jams.

➢ The causes of traffic jams are small roads and numerous vehicles in streets and people's ignorance to the traffic rules and encroachment of footpath by street hawkers and footpath shops.

➢ Traffic jams can be solved by broadening streets, control of number of vehicles on streets, carpooling, removal of street venders and proper application of traffic rules.

➢ Overcrowding, pickpocketing, molesting are common problems in public transportation.

➢   People must also learn to respect traffic rules. They must have respect for both drivers and conductors as service providers. They must teach the same to their children by setting an example.

➢   Hoarding of seats allocated for ladies, pregnant women, elderly and disabled people is also common in local vehicles.

➢   People travelling by standing in the vehicles for the whole ride is also common sight in local vehicles.

➢   Many public vehicles are old and worn out. They produce thick black exhaust of CO_2 in the environment. The main cause of air pollution in Kathmandu is transportation mediums.

➢   Loud honking horns of vehicles in traffic jams causes air pollution and mental stress and restlessness.

➢   Public rides are not worth their fares. Some taxis exploit passengers of more money by not running on meter. The fares in buses, micros and tempos are cheaper but still not worth their fare. Most of the time fares are decided upon by the conductors. For fares to be worth the ride, ticket should be stamped by ticket stamping machine for boarding time only as in foreign countries. Daily tickets, weekly tickets, fortnight tickets, monthly tickets, etc should also be introduced for convenience and fare-saving.

➢   In contrast, ride hiring services like pathao are very expensive.

➢   Most public vehicle fares are not flexible. But fares in some services like InDriver and rickshaw can be lowered by bargaining.

➢   There is no discounts or bonus in fares of vehicles. However, newly introduced ride-hiring apps like pathao have occasional bonus but they are not much worth.

➢   Seats are not enough in public vehicles. Many people are seen sharing a single seat, passengers are even crowded near gearshift of buses.

➢   Public vehicles are not available for all areas of passenger's travel. Many times, they need to transit vehicles to reach their destination. Many such transit has lots of walk in

between. Many buses have a fixed route, and they drop at the nearest destination unlike taxis and pathao.

➢ Except taxis, private vehicle and pathao, big public transportation is not available in narrow streets.

➢ Footpaths are not available in all streets. Many footpaths are encroached by footpath stalls, hawkers and homeless people causing less space to walk.

➢ Footpaths should be cleared of such stalls and hawkers. Mayor Balen Shah is promoting such action in Kathmandu city.

➢ Many people walk on streets obstructing the traffic flow.

➢ The traffic and road conditions are similar in many densely populated cities like Kathmandu in Nepal. In sparsely populated areas and rural areas, the transport system is poorly developed with many areas without any touch of road system.

➢ Both drivers and riders face complication in festival tines, where both traffic jam and passenger traffic are very high.

➢ Possible solution to transportation system in Nepal could be introduction of carpool in Nepal, smart integration of all available traffic infrastructures and its management through internet, application of e-scooters in narrow streets and old towns, supporting electric vehicles and charging hubs, introduction of electric trolleys or electric trams, expansion of roads and development of new routes and connection to the main highway.

➢ Assigning heavily used narrow roads as one-way road at specified times is also a good solution of current traffic problem.

➢ Banning heavy duty vehicles on the streets in rush hours reduces traffic jams.

➢ Construction of overhead bridges for public to cross the roads safely and easily should be built in big-laned roads and busy roads.

➢ All the transport system should be integrated and supervised by a single government body and distributed among different routes with focus upon punctuality in travel routines and stops.

➢ New technologies like monorails and metros should be introduced in Nepal.

➢   Vehicles with alternative energy source like solar powered vehicles should be supported.

➢   Traffic police should be well trained and be assigned at busy roads to help vehicles and pedestrians.

➢   Traffic infrastructure like traffic lights, streetlamps, sign boards, etc should be arranged in all streets at regular intervals as per need.

➢   Nepal cannot solve the traffic problem solely by itself. It must depend on foreign aids for support. A reason for this is Nepal being one of the 46 least developed countries (LDCs) of the world. LDCs is determined by UN *(UN List of Least Developed Countries, n.d.).* As an LDC, Nepal has its hands full on providing basic needs to its countrymen. It is already difficult for Nepal to maintain its already existing roads and transportation system. Whatever major improvements are being made on road construction and transports are being made with foreign aids. A good example is the Ringroad expansion project under the assistance of the Chinese government.

➢   Every people in the country should also participate in development of the road and travel system and should not just complain the government. Every endeavour starts with a small effort and all people must put their own initiations for this. Drivers can share their rides with others. People can opt for use of electric scooters in narrow roads and old towns like Durbar Squares.

➢   People must change their mentality of comparing expensive cars to economic prestige and use electric vehicle services like Safa tempos, trolley bus, bicycles, e-scooters, etc.

Link of interviews with stakeholders

➢ **Interview 1:**

Interviewee	Gajendra Narayan Yadav
Job	Engineer in Medical Technology
Address	Munich, Germany
Contact	+49-17663792526, gajendra_y@hotmail.com, https://www.facebook.com/gajendra.yadav.3532
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/ES2p0q8UpKBDu7x3Irxa-NkBU4WplB3fvfljX15lwYuTtw?e=tz7qN6

➢ **Interview 2:**

Interviewee	Evgenia Graevitckii
Job	Student
Address	Israel, Tel-Aviv
Contact	+972-52-544-4281, 8789070@gmail.com
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EWKJX8lFKqtFtQa8aeu4fwgBOsIg2J1g0RgrXCP3IsCEqg?e=27HRY3

➢ **Interview 3:**

Interviewee	Rajat Dhakal
Job	IT teacher at Softwarica College, Dillibazar
Address	Mid Baneshwor, Kathmandu, Nepal
Contact	9857017888, stw0088@softwarica.edu.np, https://www.facebook.com/rajat.bing
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EfNdfW0h3HNGqin9-W1VIaIB0V_ntl6ksbgU0JmwprG7VQ?e=qVGkVe

➢ **Interview 4:**

Interviewee	Prajwal Baral
Job	Student of CSIT at Ambition College
Address	New Baneshwor, Kathmandu / Bhadrapur, Jhapa
Contact	9863614398, prajwalbaral0001@gmail.com, https://www.facebook.com/profile.php?id=100070979600156
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EaEQs3dNN1ZAubkqzyUzTdsBO33UrjEAjQwMQncKHP0y-w?e=Y9BGd5

➢ **Interview 5:**

Interviewee	Diwashika Khadka
Job	ACCA student at The British College, Chakupat/ Job at AKG Associates, Kupandole
Address	Chandragiri, Kathmandu
Contact	diwashika1@gmail.com, https://www.facebook.com/diwashika.khadka.1
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EcPNaxrBAdtGm07n3R1dGG4BXOutbLq06y4K-2tMOs4gog?e=jZlPfF

➢ **Interview 6:**

Interviewee	Santoshi Gahatraj
Job	Program Lead at Karkhana Pvt. Ltd.
Address	Mid Baneshwor, Kathmandu, Nepal
Contact	9848296478, santoshi@karkhana.asia, https://www.facebook.com/santoshi.gahatraj
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EQthhcQX0bpCkCyOpA-588QBkbgl8oyTtrrdg4su6hucdQ?e=JxWZCR

➢ **Interview 7:**

Interviewee	Shrawan Thakur
Job	Sr. Lecturer at Softwarica College,|R & D Supervisor, Founder & CEO AI Marga Pvt.Ltd
Address	Lalitpur,
Contact	9851237323, ershrawan014@gmail.com, https://shrawanthakur.com
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EaDrLcjwJ6FOJjsB6DXQtCkTfaAj4QlKZxfDWQ?e=NK9MJz

➢ **Interview 8:**

Interviewee	Enjila Chapagain
Job	Graduate from Agriculture and Forestry University
Address	Bharatpur 13, Chitwan
Contact	9845936456, enjila.chapagain123@gmail.com, https://www.facebook.com/profile.php?id=100008172366480
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EWe1rgAetqhCvaq6sJNJ2isBKIgu0yXbhb_sgyWrz5LAvw?e=ikWH2m

➢ **Interview 9:**

Interviewee	Himal Koirala
Job	Student NCC
Address	Sinamangal, Kathmandu
Contact	9840755756, https://www.facebook.com/Heemal.Koirala.11
Interview Link	https://softwaricacollege-my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/Ee-05eIiQp5GlvZkpsSOZKoBSDbDAVqB3abz8YmQsdB04Q?e=uezm9m

➢ **Interview 10:**

Interviewee   Deeya Karki

Job   Student of B.Sc. 2 Year at Trichandra multiple campus

Address   Thankot, Kathmandu

Contact   9803601515, https://www.facebook.com/deeya.karkee.9

Interview

Link
https://softwaricacollege-

my.sharepoint.com/:v:/g/personal/220049_softwarica_edu_np/EW1QMBENX-

tCrJuJr49bF-ABnoRcm3zU9G9N9C7ScqOrOw?e=PcvM1a

Observations of the interview with stakeholders

The majority of the interviewees agree that the transportation system is not up to the quality at the present time. It is admitted that the public transportation system in Nepal is very uncomfortable especially when overcrowded in rush hours and that passengers are vulnerable to pickpockets, theft and molesting. The stakeholders confirm that the vehicles don't have a fixed timetable and are mostly late to their destinations because of the regular traffic jams. Therefore, people opt for private vehicles for convenience purpose even if they are costlier. With the increase of both public and private vehicles on the roads, the roads are normally jammed with vehicles and traffic polices are forced to attend to them even if traffic lights are present. Increase in the vehicles in roads is also observed to be the cause of the air and noise pollution in big cities.

The quality of roads and highways in Nepal is often poor, with many being poorly maintained or in disrepair. This can make travel difficult and dangerous, especially in rural areas where there may be no alternative routes. Likewise, there is a lack of public transportation options in many parts of Nepal, particularly outside of major cities. This can make it difficult for people without their own vehicle to get around, and may contribute to the high levels of traffic congestion. Similarly, the traffic situation in Nepal is also exacerbated by the lack of enforcement of traffic laws and regulations. Many drivers do not adhere to traffic rules, such as speeding, running red lights, or not using turn signals. This can lead to accidents and further contribute to the chaos on the roads.

Many stakeholders have proposed many possible solutions from their own perspective for the solution to reduction of traffic problems and improvement of travel system in Nepal. A few of these solutions suggested by the stakeholders include road expansion, development of new shorter routes, one-way rules, building parking spots, prioritising to electric vehicles, promoting managed public vehicles against private vehicles, carpooling, transition of old vehicle system to newer vehicles like trams, monorails, cable cars and so on.

Ideate

Brainstorming

"We may have a perfectly adequate way of doing something, but that does not mean there cannot be a better way. So we set out to find an alternative way. This is the basis of any improvement that is not fault correction or problem solving." — Edward de Bono, quote from Six Thinking Hats *(Bono, 2016)*.

The solutions to the problems of transportation system in Nepal was brainstormed through the "Six Thinking Hats" technique, presented by Edward de Bono in his book Six Thinking Hats, to look at the problems and situations from a variety of perspectives.

➢ **Blue Hat: "the Conductor's Hat"**

The main agenda of this project is to find the solution to the complications in Nepal's travel system in itself and the problems caused by it. The main problem in our transport's system is that the passengers suffer an uncomfortable and overcrowded ride which is not worth the expensive fare. Because of lack of security, there is high risk of pickpocketing and theft. The ride is not on time for the majority of time. These problems snowball rich people to buy private vehicles thereby increasing the number of vehicles past the handleable margin by the country's roads causing traffic jams. More vehicles mean more fuel usage, inflation in fuel price, air and noise pollution. The solution to this problem will benefit both the riders and the drivers to have a comfortable ride without high traffic on the road and better environment.

➢ **White Hat: "the Factual Hat"**

According to the statistics, there is a large amount of petroleum-based street vehicles in Nepal, with minor number of electric vehicles. These vehicles include public vehicles, school buses, business vehicles, tourist vehicles delivery vehicles, logistic vehicles, etc. Old electric trolley bus gifted by China could not be managed, repaired and maintained by Nepal government due to its political and financial issues and are out of service. Nepal is also receiving foreign aids in transport aspect. In 2020, Nepal was gifted with two modern trains by India *(PTI, 2020).* China has already completed phase 1 of its Ringroad expansion project

and is continuing the next phase at present. The MCC project also provides aid in improvement of Nepal's road and vehicle's development. Further road expansion is difficult due to buildings along roads.

Exhaust gases from old vehicles that burn petroleum fuels are the main cause of air pollution in Kathmandu. Old vehicles also have bad performance since they suffer from incomplete combustion of petroleum fuels.

The road congestions are common in rush hours. To meet demands of the increasing population in cities, more vehicles are added every year. Vehicles (especially parking on streets) and pedestrians cause travel inconveniences in narrow streets and old towns. Many public vehicles travelling out of Kathmandu City are packed while private vehicles for the same reason have wasted free seats.

➢ **Green Hat: "the Creative Hat"**

Old vehicles should be banned in Nepal to reduce air pollution and excessive usage of fuels. Exchange programs for old vehicles to new vehicles can be conducted. Electric vehicles should be promoted through advertisement and awareness campaigns by both government and private sectors. One-way rules should be applied in narrow roads. Busy areas with high amount of people like Bazars, old towns, tourist hotspots, etc should be walk only zone. These zones can introduce kick scooters. Electric scooters can also be a better solution in these areas for old people or tired people. Electric vehicles should be advocated with ample charging hotspots throughout the city. Usage of bicycles can also be supported through cheaper sells and dedicating bicycle lanes. All the existing travel infrastructure can be integrated into a single transport system and managing them to provide services to wider area through smart system using internet like in many foreign nations. Parking spots should be managed by properly managing existing spots or building new spots. A parking building is a good idea. Introduction of electric trams with foreign support from friendly countries like India, China, Germany, etc and organisations like MCC should be discussed by government with those countries and organisations. Using the already existing vehicles to share rides

with others should be implemented. Double decker buses should be introduced in Kathmandu, one double decker bus can be added instead of addition of two buses.

➢ **Yellow Hat: "the Optimist's Hat"**

Prohibition of usage of old vehicles running on petroleum fuels reduces the pollution of air. This also saves usage of fuel and saves money, which can be further used in constructive projects. Similarly, the government also saves money in importing fuels from other countries and can use the saved money on other developmental projects. Likewise, with vehicle exchange programs owners can buy new vehicles for cheaper price. One-way rules reduce traffic jams. No-vehicle areas are easy to walk upon without any accidents and jams. Electric vehicles and e-scooters are still new concept in Nepal. These can spark enthusiasm in people and they can enjoy up-to-date technology. Children and youths can take kick scooters and e-scooter as a means of enjoyment like skate boards while the commute. Tourists can then enjoy historic places like Kathmandu Durbar Square and other old towns without any distractions from other vehicles. Bicycle also promotes good health as it itself is a means of fitness. Building new parking buildings or parking spots clears the footpath for its sole purpose for walking. Constructing electric trams and integrating all existing vehicles into a single travel system reduces the number of school buses in Nepal and students spend only minimal time in vehicles unlike spending hours in school bus when they waste time in pickup and drop of students. This integrated travel system managed by AI is also helpful for other peoples too. Carpooling reduces the shares the cost of travel and tolls among passengers. They can promote eco-friendly ride and improve social networks. Double decker buses can replace number of single decked bus by half if implemented.

➢ **Red Hat: "the Hat for the Heart"**

All vehicle owners may not be satisfied with vehicle exchange schemes. One-way rule may not be supported by drivers. Residents living in vehicle-free zone may not like the vehicle ban rule. People may not enjoy kick scooters and e-scooters in old towns. Parents may not want to send their children to schools in trams and other vehicles. AI system to integrate all vehicles and traffic infrastructure, and construction of new parking buildings is

not the right solution for present Nepal. People may be against foreign aids. Electric vehicles, electric trolley bus, double decker bus, electric bikes and electric mopeds may not sustain for long time in Nepal.

➢ **Black Hat: "the Judge's Hat"**

Nepal being an underdeveloped country, has its hand full on maintaining its already existing road and transport system. It does not have extra capital to expend on building new parking buildings, buying AI software to manage and integrate all existing transport infrastructures. It can depend only on the foreign aid to cover such costs. However, many foreign aids come with a debt trap. In July 2017, Hambantota port was signed over to China Merchants Port (CMPort), Beijing on a 99-year lease because Sri Lanka could not repay China the loans it took out to construct the port in the first place. CMPort has a 70% stake in this port. Beijing has already docked military marines here challenging the United States as the world's pre-eminent maritime power. Many believe that China wants to develop this port as naval bases *(Liang, 2018).* Likewise, many critics assert that the MCC's primary commitment is not reduction in poverty but rather it is to reshape the legal, institutional, infrastructural and financial contexts of poorer countries to better suit the US economic and Indo-Pacific Strategy Pact's interests of the US government and to become an instrument of the new imperialism to pursue economic hegemony through the extension and ever-deepening penetration of neoliberal capitalism. Sri Lanka and Vietnam has already rejected MCC. Additionally, several of the Pact clauses of 2017's MCC Agreement has violated Nepal's Constitution, laws of the land, sovereignty, independence and non-aligned foreign policy resulting in political turmoil and protests in streets *(Dixit, 2021).*

Road expansion means demolition of houses along the streets and compensation for demolition and land-occupation to the house owner. The cost of bulldozing the buildings, land acquisition compensation, rebuilding new roads cost a huge sum of capital. Building new bicycle lanes on an already existing roads means reduction in driveway for vehicles. New bicycle lane also cost a big amount of cash. This logic also applies to construction of new lanes for monorails and electric trams including their construction, maintenance and

management costs. Electric power for such trams, trolley buses, monorails and electric cars cannot be afforded 24x7 while Nepal is still suffering from load-shedding problems. The cost of new double-decker buses in big amount is very expensive. Likewise, the cost of import of double-decker buses from abroad is lavishly high. Similarly, because of the low height of many overhead bridges on the main roads of Kathmandu valley, the double decker-bus cannot run on all the main roads and its route will be limited to roads without overhead bridges.

All vehicle owners may not be satisfied with vehicle exchange schemes as they may make losses even if they buy vehicles for lesser money. One-way rule may cause many people to take roundabout routes wasting time and effort. Residents living in the vehicle-free zone cannot bring their vehicles to their houses and must search for extra parking spots outside that vehicle-free zone. People may not enjoy kick scooters and e-scooters in old towns as they may find it hard to adapt to riding scooters and bump into pedestrians. Parents may feel more secure in sending their children to schools in comparison to trams and other vehicles as school buses has school staff as a guardian.

➢ **Blue Hat: "the Conductor's Hat"**

After observing and analysing all the above-mentioned perspectives, the best solution to solve traffic problems in Nepal is to utilize its already existing enough travel infrastructures at the present moment. This narrows our solution to carpooling where available vehicles are utilised to share rides with others either for short trips or long rides.

I support this conjecture, because Nepal needs to learn to make use of its existing travel resources and should not dream for foreign aids or construction of high-end infrastructures which it cannot afford. Failure to pay such loans can lead to debt causing economic crisis in the country and selling of national assets to foreign nations. Foreign nations can misuse our assets since they have major share in our assets. A good example is the case of Sri Lanka and China over the Hambantota port. Foreign aids can also strain our relationships with our allying nations. Nepal needs to be self-reliant on this matter and can opt for foreign loans or state of the art travel assets only when it can afford it. Government

also needs to think about the maintenance of such high-end vehicles. We already have the case of suspension of the trolley bus in Kathmandu because of the inability of its maintenance, financial and political issues, so we should not try to bite what we cannot afford. At present, car-sharing is the best option among all the available solutions as it does not require us to add any new infrastructures and we just need to rewire the use of the available vehicles. We have already seen the acceptance of ride-sharing at the time of the border blockade by India in 2015. A small unofficial Facebook page about carpooling has received thumbs-ups from many Nepalese youths. Many people also share vehicles with their colleagues in the same company reducing both the road traffic in peak hours by an average of 1-5 vehicles and the number of parked cars in the office parking lots by the same value. If the same concept can be implemented in an official manner with proper legalization from a company with proper management and marketing, it will operate grandly solving a lot of traffic problems.

Business Model Canvas

Figure 4

Business Model Canvas of carpool system in Nepal

CARPOOL

Business Model Canvas

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
• Investors • Drivers with valid license interested in carpool • IT Communities manage digital portals • Mass Media Companies • Insurance partners insures rides, vehicles and person • Vehicle Service Technicians for regular servicing of registered vehicles • Owners of Parking Lots like restaurants, buildings, banks. • Petrol Pumps • Payment Option Providers	• Product development • Marketing and Promotional Activities • Customer Support • IT Operations • Community Growth	**For Drivers:** • Cost Travel Reduction • Flexible Working Hours • Additional Income • Freedom to choose working hours • Travel Friend • Awards • Dedicated Parking and Reduced Parking Cost in Dedicated Spots like Hospitals, Stations,etc	• 24/7 Customer Service • Online Booking and Secure Payment • Newsletter • Customer Ratings, Reviews • Customer Surveys, Feedbacks • Verified Drivers, Bonuses • Social Media Support, Digital Marketing	Drivers: • Vehicle Owners and Drivers with valid license • Drivers who want flexible working time Riders: • Travelers of age group (18-50 yrs) • Non-applicable traveler (viz. children and elderly) accompanied with applicable age group • Smartphone (internet) Users • Regular Travelers, Occasional Travelers, Budget Travelers • Tourists , Eco-enthusiasts • Last minute Passengers • Students • Back-to-home Travelers in Festivals
	KEY RESOURCES • Drivers • Riders • Brand • Online Platform • Employees • Website and Apps	**For Riders:** • Economical Way to Travel • Comfortable • Safe • Easier Transactions • 24/7 availability • Sufficient Luggage Space	**CHANNELS** • Word of Mouth • Website • Mobile Apps • Social Media • Campaigns • Online Advertising • Offline Advertising	

COST STRUCTURE	REVENUE STREAMS
• Insurance, Legal and Settlement Costs • Hosting, Research and development • IT Infrastructure Expense • Marketing and Advertisement Cost • Traffic Acquisition • Taxes • Customer Support	• Brokerage Commission on each Booking • In-App Advertising • Rule breaking charges

"A business model describes the rationale of how an organization creates, delivers, and captures value" — Alexander Osterwalder *(Osterwalder & Pigneur, 2010)*. Figure 4 demonstrates the business model canvas of carpool system in Nepal.

Key Partners.

The key stakeholders in carpool system are public people, investors, drivers with valid license, owners of vehicles, mass media companies, IT Communities, Insurance companies, mechanics, parking space owners, petrol pumps and payment options providers.

Key Activities.

The key activities of this project are the carpool initialisation and development in Nepal along with its marketing and promotional activities. User friendly digital applications are made available to the public with good customer support.

Key Resources.

Drivers, riders, branding of the carpool system, online platform for the application and websites, and employees who work in this project including all department (IT individuals, management department, customer service, etc) are the key resources of the carpool system in Nepal.

Value Propositions.

Through this carpool system, drivers enjoy reduction in cost of travel expenses. They have flexible working hours by having freedom to choose the working hours themselves with an additional source of income. Rides will not be boring by driving alone as they have travel companions, and they could always make short talks. Regular carpoolers can be rewarded by the carpool company for their contribution in the development of the carpool community. They can also enjoy perks of discounted parking fees or free parking in dedicated spots in hospitals, stations, restaurants etc.

Similarly, passengers can experience a comfortable, cheaper and safe ride in private vehicles in comparison to crowded, expensive and cramped public transportation vehicles. Digital payment can be incorporated in this system making fare payment very easy. This carpool system has no operation time restrictions like public rides as carpools can be performed late at night too if driver wishes for.

Customer Relationships.

The customer relationships are maintained through 24x7 available customer hotline service, newsletter, social media support, online booking and secure payment, customer ratings and reviews, customer surveys and feedbacks, verification of license of drivers and bonus programs for the regular users.

Channels.

Carpool System communicates with and reaches our customer segments to deliver our value proposition through channels of words of mouth, official website and mobile applications. Social medias, campaigns, online advertising as well as offline advertising also play a major role as our channels of contact with the customers.

Customer Segments.

Drivers and riders are the two main groups of people our carpool enterprise aims to reach and serve. The drivers segment covers vehicle owners and drivers with valid license. The drivers who want flexible working time are our main targets. The riders segment includes all traveller of age groups 18-50 years with access to smartphone and internet connection. Travellers of the remaining age groups viz. children and elderly can also travel along with guardians. The travellers can be of regular traveller, occasional traveller or budget traveller types. Tourists, eco-enthusiasts, students, last minute passengers and back-to-home travellers in festivals also make a major part in this rider segment.

Cost Structure.

To operate carpool system in Nepal, costs are incurred in fields of insurance, legalisation and settlement, hosting, research and development, IT infrastructure, marketing and advertisement, traffic acquisition, tax and customer support.
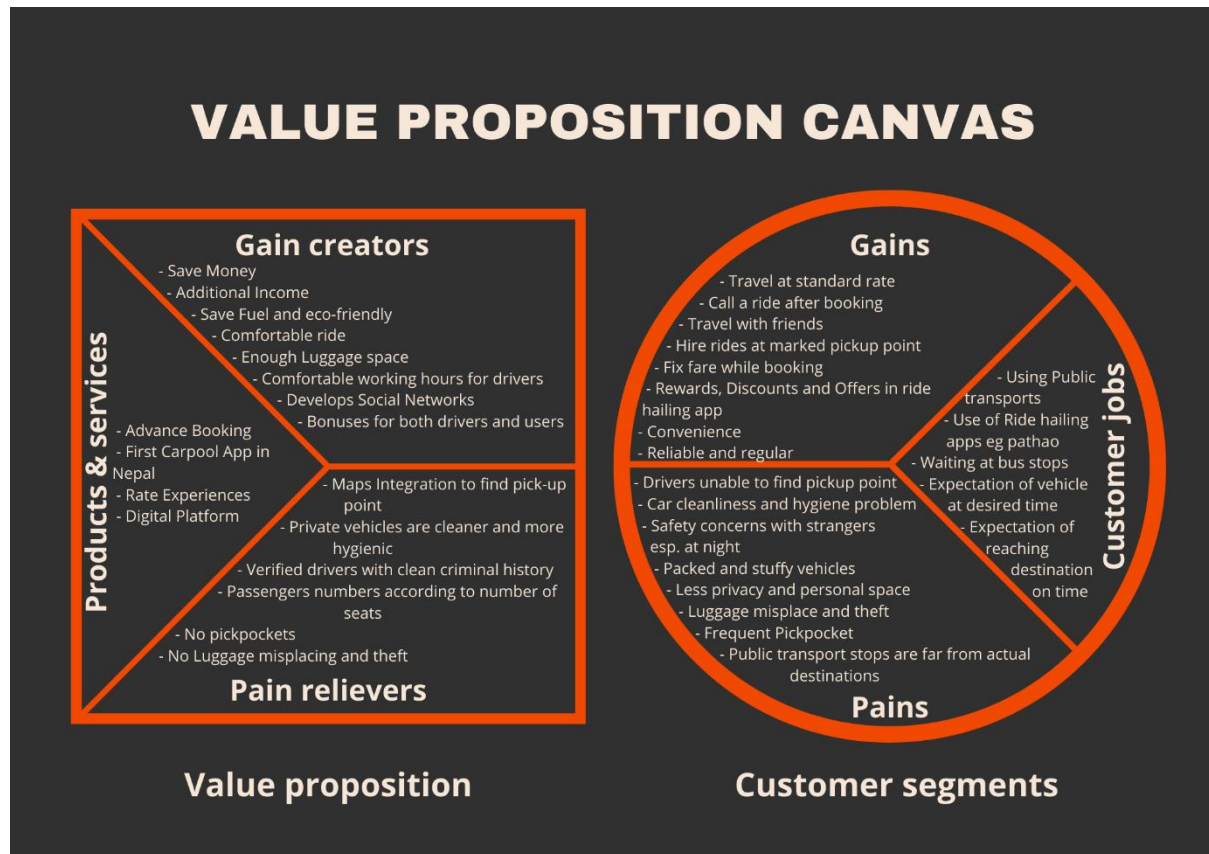
Revenue Streams.

Carpool system in Nepal generates cash from each segment via brokerage commission on each booking, in-app advertising and charges for rule breaks by the customer.

Value Proposition Canvas

Figure 5

Value Proposition Canvas of carpool system in Nepal

"Your customers are the judge, jury, and executioner of your value proposition. They will be merciless if you don't find fit!" — Alexander Osterwalder *(Osterwalder & Pigneur, 2014)*.

Figure 5 depicts the value proposition canvas of carpool system in Nepal.

Customer Segment.

➢ **Customer Jobs**

Contemporarily, people utilize public transportation system (viz. Nepal Yatayat, Sajha Yatayat, etc.), ride-hailing services (viz. InDriver, Pathao, etc.) or their own private vehicles as a means of transportation. Passengers wait on their vehicles at respective stops (Bus stop, Taxi stop, etc) or pick-up points for ride-hailing services. They expect the public transport vehicles to arrive regularly within 5-10 minutes and board the so vehicles with the expectation to reach their destination early if the road is clear with no traffic-jams.

➢ **Pains**

The main pain of the present transportation system is that it is not punctual. Ride-hailing system are many times unable to pinpoint the pickup point even though they are using GPS system. Public vehicles are overcrowded and stuffy along with unclean seats. The rides are normally uncomfortable with no to none personal space. There is always danger of pickpocketing and luggage theft in public transport when it is packed with passengers. People cannot ride in peace being among strangers, especially females are regularly molested in crowded vehicles where the culprit is difficult to ascertain. Another pain for passengers is that their stops are not always near to their destinations, and they must walk an extra distance to reach their destination. Reserved vehicles are way too expensive in comparison to normal public vehicles. Tickets are very expensive during festival times and are very difficult to book.

➢ **Gains**

The public transportation fares are regulated by the government and people can travel alone or along with their acquaintances. Students are also eligible to receive discount if they show their student ID card to the conductor. Normally the vehicles are regular and reliable. Ride-hiring system facilitates the choice of vehicle type and pick-up point as per need with regular offers, discounts and rewards. Some travels like InDriver have price bargaining system to lower the ride price.

Value Proposition.

➢ **Product and Services**

Carpool system is an advance booking system and thereby, people can properly manage their travel in advance. It is the first carpool system in Nepal. Carpool has shown great success in many abroad countries like USA, Europe, India, Pakistan, Thailand, and so on. Riders can rate their experience in carpools and give feedback for the other customers to view. Being a digital platform, it is very easy to use with minimal knowledge of smartphone handling.

➢ **Pain Relievers**

Carpool system has map integration to find the route of the ride and to find pickup point. Since almost all the vehicles are private, they are cleaner and more hygienic than public vehicles with enough leg space for a comfortable ride. If public vehicle is flying in economic class, then carpool is like flying in business class. All carpoolers are verified users without any criminal history. Their background is checked by the carpool company. Carpools are never overcrowded and many carpools have AC installed being private cars. Carpool advertisements are placed according to the free seats available. There is nil chance of baggage theft and pickpocketing from strangers.

➢ **Gain Creators**

Carpools facilitates both the driver and rider to share their travel expense among themselves, hence they pay cheaper in comparison to public transport system. It also acts an additional source of income to the drivers. There is lesser number of vehicles on road because people are making optimal use of all available vehicles. Lesser number of vehicles implies lesser traffic congestions and lesser fuel burn up and lesser impact to the environment. Better environment implies better health both mentally and physically. Government can save money on importing lesser fuels from abroad since lesser fuels are used in comparison to the scenario when none carpool existed. This money can be invested in other development projects. The ride is comfortable for both the driver and passengers with enough leg space and luggage space. The working hours is flexible for the driver. Development in social network is a bonus point in carpool. Carpool system also provides bonuses to the regular carpool drivers and riders.

SWOT Analysis

Figure 6

SWOT Analysis of carpool system in Nepal
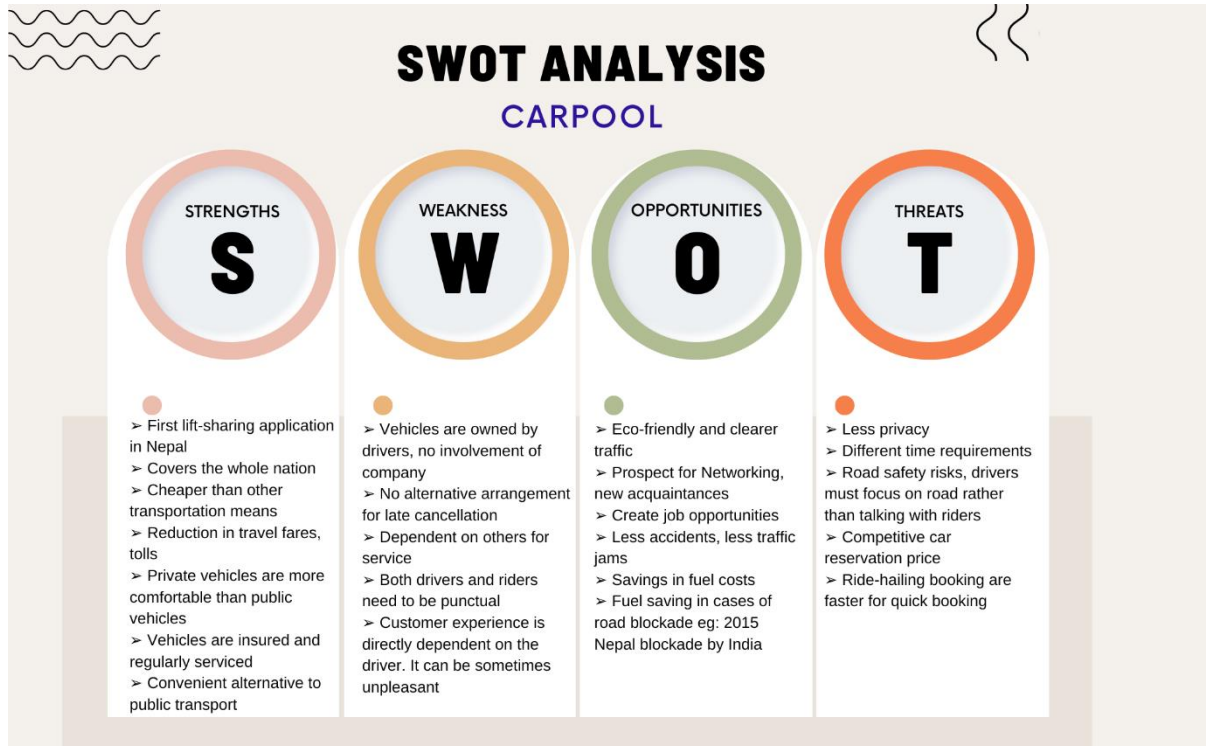
"The SWOT Analysis: Using your Strength to overcome Weaknesses, Using Opportunities to overcome Threats." -Lawrence G. Fine *(Fine, 2009)*.

Figure 6 presents the SWOT analysis of carpool system in Nepal.

Strengths.

The main strength of this system is that it is the first lift-sharing project in Nepal and it also covers the whole country which garners the pioneering advantage from the citizens. Riders benefit from more comfortable ride and cheaper travel fare in comparison to public transportation. Driver also saves money in fuel and toll payments by sharing the cost among his/her riders. Carpooled vehicles are normally insured and regularly serviced by their owners as per the regulations of carpool system and also for gaining better ratings from their customers.

Weakness.

Conversely, there are no arrangements provided by the carpool system in case of late cancellation unlike public transportation. The company does not own any vehicles and all vehicles are private property of the driver. Drivers are not the workers for the company, rather both the company and driver work for their mutual benefits. This dependency on drivers who are not under any job contract with carpool company is a negative point since the company cannot punish drivers no can reimburse customers in case of any customer dissatisfaction. Since the drivers are voluntarily working with the company, they are not required to be polite to riders unlike workers in public transportation. Hence, riders cannot always expect business courtesy from drivers and it depends wholly on the driver's personality. Thereby, carpooling can be sometimes unpleasant. Being punctual is a must for carpooling unlike ride hiring system like uber, Pathao, etc.

Opportunities.

The main opportunity provided by this system is eco-friendly transportation system with clearer traffic with the use of already available travel resources. Clearer traffic means reduction in air pollution and noise pollution which makes the environment clearer, fresher and more silent. A review in 2019 has revealed sufficient evidence that sources of transportation noise lead to serious annoyance, sleep disturbance, depression and cardio-metabolic disorders *(Dzhambov & Lercher, 2019)*. Hence, a better environment is always welcome for curbing air related health problems and improving peacefulness in people. Less traffic-jams can help in better maintaining people's physical and mental health. There is a high probability of decrease in rise of vehicles in Nepal because of properly managed transportation system through publicly endorsed carpool system. This can opportune lesser use of fuels and saving in capital for the country as a whole in importing fuels from abroad. Fuel saving can also help in the future if Nepal faces similar roadblocks like in 2015 from India. With lesser vehicles, congestion in roads will be lesser in number. Finally, there is also the prospect of developing social networks by making new acquaintances by sharing ride.

Threats.

The main threat of this system is that it's booking for quick use is not as fast as other transportation means. The time requirements of both driver and riders may not match all the times and hence driver may need to travel alone or the rider cannot find any carpool and opt for other means of transportation. Sometimes either the rider or driver may attempt to encroach the privacy of the other by being over-talkative or by showing unnecessary effort in their socialisation. Conversation while driving is always a risk for accidents on the road.

PESTLE Analysis

The PESTLE analysis provides assistance to identify the external forces that could impact an organization and its business. It has been conducted to examine different influential factors affecting the shared mobility industry (carpooling).

➤ **Political Factors**

The political bodies of Nepal have a great influence in carpooling in Nepal. A policy of the government depends on the ruling political bodies. A stable ruling party with concerns to environmental and traffic solutions will support carpool. However, an unstable ruling party with internal strife or corrupt government will tend to turn a blind eye towards alternative travel systems like carpools. A country with political turmoil is more likely to suffer from strikes, vehicle vandalism and traffic disruption actions that severely affects the carpool users and their travel routes. Many political parties can also add carpooling in their political manifestos too to support carpooling by addressing its importance to the public and implementing positive Acts and laws towards it when they are in the government. The political body of Nepal can learn from the foreign nations and dedicate parking incentives and spots for carpoolers.

➤ **Economic Factors**

Ownership of vehicles along with the expenses of fuelling, maintenance, parking, insurance, and taxation amounts a huge money and still many people tend to own private vehicles for the sake of their convenience. According to Department of Transport Management (DoTM) in 2016/17, Bagmati province has 119,956 vehicle registrations which includes 14,542 cars and jeeps, and 94,751 motorcycles *(Department of Transport Management, n.d.)*. With the popularisation of carpooling, non-owners of private vehicles can also enjoy the convenience of carpooler's private vehicle and they will tend to buy lesser new vehicles for themselves. This saves the money of rider from buying unnecessary vehicles. Drivers can also earn extra money from the rider and share his travel cost, fuel cost, parking cost and toll cost with the rider.

The country can also further save money in fuels importation because of lesser consumption of gasoline. Lesser vehicles on road due to ride-sharing means lesser jams, lesser accidents and further lesser destruction of public property due to accidents which implies saving in money for reconstruction of the damaged property by the related authority.

➢ **Social Factors**

At present in Nepal, people label ownership of private vehicles as a status symbol. Because of this trend, people tend to go bankrupt or in debt just to buy a private vehicle. However, research shows that educated and conscious people tend to incline towards carpooling to solve traffic congestion, reduce air pollution and save energy resources. This aspect is also presented by many lifestyle influencers through social medias and news channel to motivate their fans and followers. According to Bachmann, individuals have higher intentions to carpool themselves when they believe others are also carpooling *(Bachmann et al., 2018*). More people could be encouraged to start the practice of carpooling by making carpoolers visible through information and awareness programs (e.g. car stickers showing vehicles that are carpooling). Information and campaign measures can also emphasize the environmental benefits of carpooling on social levels by community and clubs to advertise carpooling. People can also meet new people and expand their socialisation network.

➢ **Technological Factors**

In the 21st century, everyone is connected with each other through the internet. People using internet in smartphone or computers can easily post a carpool advertisement on one end and another individual can easily search and book that carpool advert with a click. Similarly, the telecommunication means make it possible to call and fix a meetup point, while the GPS system makes it possible to reach the pickup point. Innovations in the development of a custom app has permitted the carpool company to create a low-maintenance workforce who can be easily communicated via one app. Payment has also been simplified by mobile banking and other third-party payment services like paypal, esewa, Khalti, fonepay, etc. Cloud computing has also made it possible for quick connection to the

database of the applications and computer networking. Figure 7 illustrates the typical technological forms and applications of ride-sharing service.

Figure 7

The typical technological forms and applications of ride-sharing service (Guo et al., 2016).
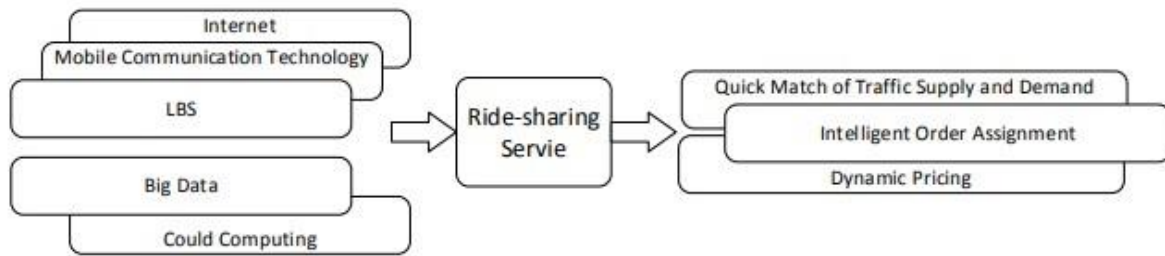
➤ **Legal Factors**

Unlike many foreign countries, in Nepal at the current date no legal policies are drafted regarding in support for and against carpooling in Nepal. Similarly, there is no attempt to incentivize people of its application. The government did not implement any taxation policy against lift sharing through Facebook in 2015 during border blockage by India, but rather indirectly supported it since it was a humanitarian act by people at that time without any money-making schemes. The same support for car-sharing can be anticipated from the government in the future. The legal body must vote in support for the carpooling to solve road congestion, air pollution, road accidents and other prevalent traffic problems following the lead of foreign countries like USA, EU nations, China, etc.

The carpool company must act according to the employee protection laws, anti-discrimination laws, health and safety laws, consumer protection laws, intellectual property laws of the nation. The company must provide a secure work environment for the workforce without any discrimination. The company must protect the customer's data for privacy and security concerns and must not leak their information to third party like fraudaulent marketers. They must adhere to intellectual property regulations that are designed to protect the companies' patents and valuable ideas.

The government can designate high occupancy vehicle policy (occupancy of more seats in vehicles) and congestion charge for private vehicles with excess free seats to motivate public to carpool.

➢ **Environmental Factors**

Vehicles play a major role in production of greenhouse gases, particulate pollution (PM like PM_{10}) and total suspended particulate (TSP) that causes air pollution in Kathmandu Valley as illustrated in figure 8 *(O & G, 2017)*. PM refers to a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke are so small like PM_{10}(smaller than 10 micrometres) cannot be seen with the naked eye and can only be detected using an electron microscope. TSP is totality of small solid matter released and documented in the atmosphere. Vehicle is also one of the main causes of noise pollution in Kathmandu.
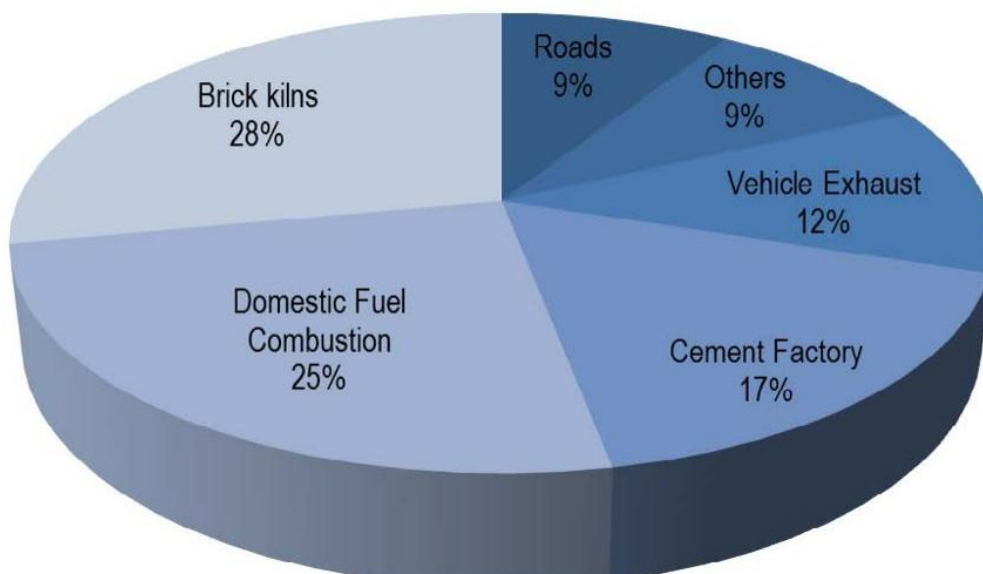
Carpooling reduces the number of vehicles on roads thereby reducing the burning of fuels that causes air pollution and honking noise that causes noise pollution. Therefore, it is eco-friendly and an innovative solution to reduce the air and noise pollution level in Nepal.
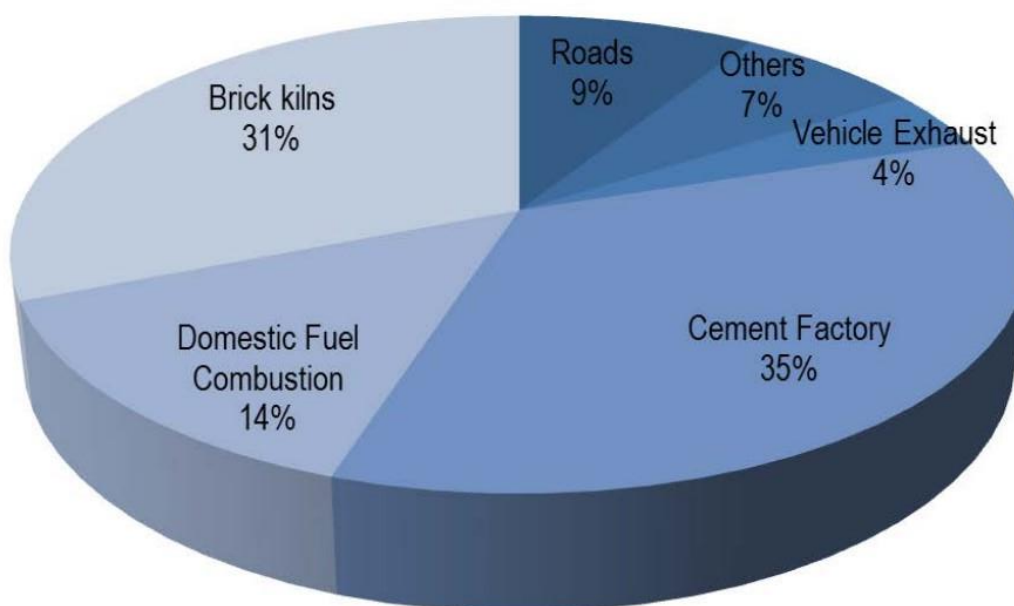
Figure 8

Sources of PM10 and TSP in Kathmandu in 2017 (O & G, 2017).

Sources of PM_{10} in Kathmandu Valley

- Brick kilns 28%
- Roads 9%
- Others 9%
- Vehicle Exhaust 12%
- Cement Factory 17%
- Domestic Fuel Combustion 25%

Sources of TSP in Kathmandu Valley

- Brick kilns 31%
- Roads 9%
- Others 7%
- Vehicle Exhaust 4%
- Cement Factory 35%
- Domestic Fuel Combustion 14%

Design Thinking Approach

"The design is not just what it looks like and feels like. The design is how it works" — Steve Jobs, CEO of Apple Inc. *(Chou-Tac, 2015).*

The main ideology behind design thinking approach is to adopt a designer's mindset and approach the problem from the user's perspective, in order to come up with innovative solutions. To implement the idea of "The design is how it works." as quoted by Steve Jobs, the iterative and non-linear process of design thinking approach that contains five phases: Empathize, Define, Ideate, Prototype and Test was visited as per need.

➢ **Stage 1: Empathize—Research Your Users' Needs**

The residents of Nepal have the desire to promote carpooling system in Nepal in order to help the government to minimize the traffic problems through local participation. Many conscious citizens wish to participate in carpooling to reduce their travel expenses, ride comfortably, expand their social networks and preserve their environment. They are currently using social media like Facebook to ask for sharing the rides.

➢ **Stage 2: Define—State Your Users' Needs and Problems**

First of all, both the drivers and riders don't have a platform for connection between each other. There is no stage for the drivers to advertise their carpool and also no such stage for the passengers to apply for such carpools. Though people post carpools in Facebook, it is very difficult to find them among all the comments and wall posts. To find such posts, they need to waste a lot of time. Even if some carpools are found, they might not be a match to the rider's requirement.

➢ **Stage 3: Ideate—Challenge Assumptions and Create Ideas**

A carpool office can be established like ticket booking offices in travel agencies, popular parking spots, and key city areas. The address and phone number of these carpool offices can be updated in popular search engines like google, yellow pages and map applications for easy contact. Likewise, a common platform based on the internet can be developed for both the drivers and riders to post and search carpools. Carpools can also be arranged through the words of mouth, especially for people living in a same locality and

working in same corporation. A hotline for carpool can be arranged with workers assigned to enter new carpool advertisements or search for existing carpools that match their travel route and travel date.

➢ **Stage 4: Prototype—Start to Create Solutions**

An online application branded as "Sahayatri Carpool" based on both desktop and smartphone is developed. The software is supported in all android, ios and windows smartphones and computers. The software is programmed to be user friendly so that users can post carpools specifying departure location, destination location, number of free seats and date-time for carpool with others additional information as per the need. The riders can search such carpools with minimal input of departure and destination location with date-time. Users can register to make their personal account, so they can log in later easily. They are also provided with privileges of messaging with each other for deciding the meet-up points. Other facilities like notification when driver reaches the meet-up point, map integration showing direction of the vehicle and hotline for customer support can also be added as per the user's need.

➢ **Stage 5: Test—Try Your Solutions Out**

The developed software called "Sahayatri Carpool" is available in the official website of the carpool and popular download stores like Google Play store, Apple Store, Amazon Store, etc for download. The beta version can be downloaded and used for trial purpose. Necessary updates can be made or added as per the feedbacks of the customers. An official version of the software is rolled for the public to use after the trial version's success. Regular maintenance and upgrade are made as per the requirement to improve customer's service, immersion and satisfaction.

Strategic Model

"Building a visionary company requires one percent vision and 99 percent alignment." - Jim Collins & Jerry Porras in their book Built to Last: Successful Habits of Visionary Companies *(Collins & Porras, 1994)*.

Understanding the essence of the above-mentioned quote of Jim Collins and Jerry Porras, for the sustainability of the carpool system in Nepal, the carpool team adapted following strategic model.

➢ **Competitive Forces**

The Sahayatri carpool system in Nepal implements the differentiation strategy to offer Nepal's first commercialized carpool service with unique features and benefits that are valued by customers to distinguish itself from its competitors. The company brands the carpool system under the label of "Sahayatri". Sahayatri is a nepali language term with the meaning of "passengers sharing a ride or journey". The use of word from the local language attracts the affection and attention of the Nepali consumers to the carpool service. Differentiating itself by establishing a positive image in the minds of customers could involve creating a memorable brand identity, building customer loyalty, and offering excellent customer service. The most distinctive point of this service is that it covers its services throughout the whole nation. While rival companies focus only in rides within a city, Sahayatri carpool doesn't limit itself within a small territory. Travel between cities and village is also possible with this carpool system. Carpool branch office is also opened in many cities to provide direct services to the customers. The company focuses on convenience, offers competitive pricing and rewards systems. The company provides a user-friendly app with simple registration that can be downloaded easily. The application covers a large network of carpoolers and provides convenient services like flexible pickup and drop-off options, in-car entertainment, refreshments, or loyalty rewards for frequent users with affordable price in comparison to other ride hiring apps like pathao. This also offers discounts for frequent users, or pricing options that are more appealing to certain customer segments. Carpoolers are provided free or reduced costs in parking or fuelling because of the

company's contact with parking owners and fuel-stations. Patients, disabled and elderly are prioritized for comfortable ride. The carpool system focuses on sustainability by appealing to the environmentally-conscious customers. This involves promoting the environmental benefits of carpooling, such as reducing carbon emissions and reducing traffic congestion.

➢ **Investment Framework**

Since the investment regarding carpool is easy to copy, the Sahayatri carpool company will take chance in the competitive market for its sustainability following its differentiation strategy plans. In terms of investment, a carpooling venture in Nepal would likely require significant initial investment to build out the necessary infrastructure and technology, as well as to promote the service to potential users. However, if the venture is successful, it has potential to become a sustainable business with revenues generated through user fees and partnerships with businesses and governments.

➢ **Hyper competition**

The Sahayatri carpool system is continuously innovating new ideas and services to introduce in carpool system to sustain in the competitive market. To be successful, this carpooling venture in Nepal would differentiate itself through unique features, such as specializing in certain types of trips or targeting a specific demographic, as well as having a strong marketing and advertising strategy to promote the service to potential users. It also plans to add ride hiring services, taxi services and ticket booking services in the future.

➢ **Sustainability of Competitive Advantage**

To sustain in the market, the company intends to provide the whole country with the carpool service with the its huge network of carpoolers. With the assistance of current telecommunications networks, people can also make use of the carpool services through SMS if they are offline or use old generation mobile phones. Regular surveys on the impact of carpool service to income growth, traffic jam reduction and pollution improvement will be posted on the official website and applications. This aware the people of their win-win involvement in economic and environmental aspect and motivates them to further use carpool.

Business Ethics

> "Ethics is knowing the difference between what you have a right to do and what is right to do." - Chief Justice of the U.S. Supreme Court Potter Stewart, *(Huber et al., 2018).*

> "Business ethics is the application of ethical values to business behaviour." – Institute of Business Ethics *(Institute of Business Ethics, 2022).*

Business ethics and corporate governance are vital to any organizations. It is also important to Sahayatri carpool system in Nepal for a variety of reasons. Corporate governance, which is the framework for managing and directing businesses, is the responsibility of the boards of directors. The goal of corporate governance is to support efficient, innovative, and responsible management that can ensure the long-term success of the business. It emphasizes upon the company's code of conduct. It maintains the company's business within the boundaries of the law, ensuring that no crimes are committed against their employees, customers, consumers, or other parties and thereby, securing the trust between the business and consumers.

> Some ethical considerations that may be relevant to a carpool system in Nepal include:

➢ **Leadership**: The company leaders should put on a conscious effort to lead the respective teams. They should adopt and integrate the other business ethics to make a professional decision. The leaders should not take sides in employee arguments and solve conflicts of interests professionally.

➢ **Honesty**: The company and employees should build an honest relationship between themselves and also with their customers. The company and the employee should not lie to their customers about their services and offers just to increase their involvement. Lying can promote short term profits but can destroy the whole organisation in the long run.

- **Follow the laws**: The company must abide by the laws of the government and respects the rules and regulations.

- **Compassion**: All the employees, business partners, and customers should be treated with compassion.

- **Accountability**: It covers both the personal and corporate responsibility. Both the company, employees and customer should be responsible for their actions. Employees should fulfil their responsibilities according to their job description and acknowledge their fault to the company or consumers. Similarly, the company should also fulfil their responsibility to their employees and the customers and accept their fault against them. The employees should not misuse company assets and time, and also should not cultivate a hostile workplace. The company should provide compensations to the employees or customers for problems caused by them and also reward employees and customers for their efforts and loyalty.

- **Respect for others**: The company should adhere to the principle that everyone deserves respect. No one should stain the dignity of the company, employees and the consumers. Everyone should be treated equally despite the difference in their background and ethnical group. The company should respect the privacy of its employees and customers. The data related to their employees and customers should be protected and never be misused or sold to other parties without their authorisation.

- **Fairness**: All the employees should be treated fairly despite their ethnicity and backgrounds. This fairness should also be implemented to the customers and other stakeholders. Everyone should be provided with the same chance to any kind of opportunity. Business must strive to treat its customers with equal respect, and offer the same goods and services to all based on the same terms without any prioritisation nor any discrimination.

- **Corporate Transparency and trustworthiness**: The companies should ensure transparency about their financials, price changes, hiring/firing practices, wages, promotions, etc to their stakeholders with clear communication and documentation of policies and procedures. This promotes trust among the stakeholders and clients. Transparent corporates are also held as honest and truthful.

- **Safety and security:** The safety of carpool participants should be a top priority. This may involve setting rules for the use of seat belts and other safety measures, enforcing rules strictly for the maintenance and upkeep of vehicles, as well as establishing guidelines for responsible driving behaviours. The drivers must have valid driving licences and the company must inspect it.

- **Community Outreach:** The company should involve in social programs like awareness programs regarding carpools, preservation of environment, traffic campaigns, etc. This might also involve promoting carpooling as a way to reduce traffic congestion and improve air quality, or offering carpooling options to those who may have limited access to transportation.

- **Loyalty**: Employees should maintain their commitment to the company. They should put their company foremost and never speak ill of their company publicly. The company and employees should maintain a healthy relationship with their customers to inspire loyalty in them to their services though respect, honesty, transparency and good customer service.

- **Environmental concern**: Carpool system in Nepal is opted as a sustainable solution to air and noise pollution. It should always work in reducing environmental problems and be eco-friendly. It by no means should hamper the environment for profit purposes.

Conclusion

Transportation system, both public and private, is an important means of movement from one place to other either of short or long distance. It saves both effort and time in a journey. Similarly, it is a great convenience for people like disabled people, patients, old people, pregnant women and children. A good transport system is also a measure of a developed country and its citizen's life standard.

Nepal's development in transportation system is under an acceptable margin. Roads haven't reached all parts of the country and the available roads are either in bad condition or are congested by vehicles. The current mediums of public transportations are neither comfortable nor secure. Although expensive they are not punctual to their destination. Additionally, they also have negative impact on the environment and people's health.

The problems of transportation system can be minimised with several traditional and innovative ideas which require the collective efforts and participation of both public and government. Foreign aids, introduction of carpools, smart traffic management, managed parking lots, use of e-scooters in narrow streets, proper traffic discipline, new modes of rides like trams and monorails, etc are also answers to solving traffic complications.

Carpool is a great fix for the traffic problems in the current Nepal. It realises the problems of transportation by using already existing fully unutilised vehicles by sharing rides with other passengers who have the same route. Both driver and rider(s) reduce their travel expenditure by sharing it among themselves. The main motto of carpool is "sharing is caring". People share their expenses and ride, and care for their socialisation, health, environment and country's development. It has great strengths and opportunities as value propositions for the customers following proper business ethics.

Reference

Alfred North Whitehead Quotes. (n.d.). BrainyQuote. Retrieved December 1, 2022, from
https://www.brainyquote.com/quotes/alfred_north_whitehead_119000

Bachmann, F., Hanimann, A., Artho, J., & Jonas, K. (2018). What drives people to carpool?
Explaining carpooling intention from the perspectives of carpooling passengers and
drivers. *Transportation Research Part F: Traffic Psychology and Behaviour*, *59*,
260–268. https://doi.org/10.1016/j.trf.2018.08.022

Bono, E. D. (2016). *Six Thinking Hats* (International Edition). Penguin UK.

Cable Cars in Nepal – Boss Nepal. (n.d.). Boss Nepal. Retrieved December 14, 2022, from
http://bossnepal.com/cable-car-nepal-2/

Collins, J., & Porras, J. I. (1994). *Built to Last: Successful Habits of Visionary Companies*
(3rd ed.). Harper Business. https://www.amazon.com/Built-Last-Successful-
Visionary-Essentials/dp/0060516402

Chou-Tac. (2015, May 13). *Design is not just what it looks like and feels like. Design is how it
works. - Steve Jobs*. THE DESIGN SKETCHBOOK. Retrieved December 19, 2022,
from https://www.thedesignsketchbook.com/design-is-not-just-what-it-looks-like-
and-feels-like-design-is-how-it-works-steve-jobs/

Department of Transport Management. (n.d.). *Details of Registration of Transport up to
Fiscal Year 2046/47-073/74*.
https://old.dotm.gov.np/uploads/files/bagmati073074.pdf

Dixit. (2021, September). *In the name of Development Aid*. My Republica. Retrieved
December 26, 2022, from https://myrepublica.nagariknetwork.com/news/in-the-
name-of-development-aid/

Dzhambov, A. M., & Lercher, P. (2019). Road Traffic Noise Exposure and
Depression/Anxiety: An Updated Systematic Review and Meta-Analysis.
International Journal of Environmental Research and Public Health, *16*(21), 4134.
https://doi.org/10.3390/ijerph16214134

Fine, L. G. (2009). *The SWOT Analysis: Using Your Strength to Overcome Weaknesses, Using Opportunities to Overcome Threats* (1st ed.). CreateSpace Independent Publishing Platform.

Freepik. (2019, February 4). *Illustration happy company people in car Premium Vector*. Freepik. Retrieved December 11, 2022, from https://www.freepik.com/premium-vector/illustration-happy-company-people-car_3866647.htm

Guo, R., Liu, Z., & Cai, J. (2016). Research on Effectiveness of Ride-sharing Service in China Based on PEST Analysis. *Proceedings of the International Conference on Promotion of Information Technology (ICPIT 2016)*. https://doi.org/10.2991/icpit-16.2016.16

Himalayan News Service. (2017, December 18). *Govt to ban 20-year-old public vehicles from mid-March*. The Himalayan Times. Retrieved December 11, 2022, from https://thehimalayantimes.com/business/government-ban-20-year-old-public-vehicles-mid-march

Huber, S., International Security Ligue, & ComGroup. (2018, January 23). *A term explained – «Code of Conduct and Ethics»*. International Security Ligue. Retrieved December 15, 2022, from https://www.security-ligue.org/news?tx_news_pi1[action]=detail

Institute of Business Ethics. (2022). *What is business ethics?* Institute of Business Ethics - IBE. Retrieved December 11, 2022, from https://www.ibe.org.uk/knowledge-hub/what-is-business-ethics.html

Jacob, S. (2020, February 4). *6 smart mobility solutions that are helping to reduce traffic congestion*. Microsoft Industry Blogs. Retrieved December 9, 2022, from https://cloudblogs.microsoft.com/industry-blog/automotive/2020/02/04/6-smart-mobility-solutions-that-are-helping-to-reduce-traffic-congestion/

Khanal. (2014, November 3). *Kathmandu Durbar Square to be no-vehicle zone from Nov 1*. Walkeasyktm. Retrieved December 14, 2022, from https://walkeasyktm.wordpress.com/2014/11/03/kathmandu-durbar-square-to-be-no-vehicle-zone-from-nov-1/

Kim. (2022, October 21). *Innovative Traffic Solutions Around the World*. The Starfish.

Retrieved December 9, 2022, from

https://thestarfish.ca/journal/2022/08/innovative-traffic-solutions-around-the-

world

Liang. (2018, September 11). *Sri Lanka hands over port to China to pay off debt*. The

National News. Retrieved December 14, 2022, from

https://www.thenationalnews.com/world/asia/sri-lanka-hands-over-port-to-china-

to-pay-off-debt-1.684606

Nepal Compact. (2022, September 15). Millennium Challenge Corporation. Retrieved

December 14, 2022, from https://www.mcc.gov/where-we-work/program/nepal-

compact

O, A., & G, K. (2017). Chemical and Thermodynamic Processes in Clay Brick Firing

Technologies and Associated Atmospheric Emissions Metrics-A Review. *Journal of*

Pollution Effects &Amp; Control, 05(02). https://doi.org/10.4172/2375-

4397.1000190

Onlinekhabar (Ed.). (2019, June 2). *Heavy vehicles to be banned from operating within*

Kathmandu Valley during office hours. https://english.onlinekhabar.com/.

Retrieved December 11, 2022, from https://english.onlinekhabar.com/good-laden-

vehicles-to-be-banned-from-operating-within-kathmandu-valley-during-office-

hours.html

Osterwalder, A., & Pigneur, Y. (2010). *Business Model Generation: A Handbook for*

Visionaries, Game Changers, and Challengers (The Strategyzer series) (1st ed.).

John Wiley and Sons.

Osterwalder, A., & Pigneur, Y. (2014). *Value Proposition Design: How to Create Products*

and Services Customers Want (1st ed.). Wiley.

PTI. (2020, September 19). *India hands over two modern trains to Nepal*. cnbctv18.com.

Retrieved December 14, 2022, from https://www.cnbctv18.com/economy/india-

hands-over-two-modern-trains-to-nepal-6959941.htm

Poudel (Ed.). (2022, February 8). KUL MAN GHISING Rush Hour. *SpotlightNepal*.

Retrieved December 9, 2022, from

https://www.spotlightnepal.com/2022/02/08/kul-man-ghising-rush-hour/

Project | china.aiddata.org. (n.d.). Retrieved December 9, 2022, from

https://china.aiddata.org/projects/34420/

Pursell. (1943). *When you ride alone you ride with Hitler!, 1943*. New Hampshire Historical

Society. Retrieved December 18, 2022, from

https://www.nhhistory.org/object/264827/when-you-ride-alone-you-ride-with-

hitler-1943

Setopati. (2018, March 26). *Patan Durbar Square to be vehicle-free zone from April 14*.

Retrieved December 14, 2022, from https://en.setopati.com/social/119566

Shrestha. (2018, January 30). *Let's make the ancient town of Bhaktapur, Nepal a truly

vehicle free zone | Danida Alumni Network*. Danida Alumni Network. Retrieved

December 14, 2022, from https://alumni.dfcentre.com/lets-make-ancient-town-of-

bhaktapur-nepal-a-truly-vehicle-free-zone

Singh. (2022, January 6). *Kathmandu's notorious traffic jams: A few solutions*. The

Himalayan Times. Retrieved December 1, 2022, from

https://thehimalayantimes.com/opinion/kathmandus-notorious-traffic-jams-a-few-

solutions

Taylor. (2018, June 9). *Carpool Kathmandu*. The Annapurna Express. Retrieved December

18, 2022, from https://theannapurnaexpress.com/news/carpool-kathmandu-461

UN list of least developed countries. (n.d.). UNCTAD. Retrieved December 13, 2022, from

https://unctad.org/topic/least-developed-countries/list

Wikipedia contributors. (2022, June 2). *Millennium Challenge Corporation's Nepal

Compact*. Wikipedia. Retrieved December 14, 2022, from

https://en.wikipedia.org/wiki/Millennium_Challenge_Corporation's_Nepal_Compa

ct

Wikipedia contributors. (2021, July 8). *Trolleybuses in Kathmandu*. Wikipedia. Retrieved

    December 14, 2022, from

    https://en.wikipedia.org/wiki/Trolleybuses_in_Kathmandu

Wong. (2014, June 13). *Seven ways cities around the world are tackling traffic*. World

    Economic Forum. Retrieved December 9, 2022, from

    https://www.weforum.org/agenda/2014/07/seven-ways-cities-around-world-

    tackling-traffic/