MEASURING THE RESILIENCE OF RIDE SOURCING SERVICES

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Declaration

I certify that this research work titled “Measuring the resilience of ride sourcing services” is my own work. The work has not been presented elsewhere for assessment. The material that has been used from other sources has been properly acknowledged / referred.

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Thesis Acceptance Certificate

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Abstract:

The emergence of shared-economy platforms and smartphones has enabled the rise of on-demand transportation services, leading to new opportunities and complexities in urban mobility. These services are commonly referred to as Transportation Network Companies (TNCs) due to their internet-based nature. While ride-sourcing remains the most prominent service offered by TNCs, there is limited understanding of its impact on traditional taxi usage and other transportation modes, as well as the implications of having numerous idle vehicles cruising for passengers. This study aims to investigate the resilience of ride-sourcing services, considering various factors such as social, environmental, economic, adaptive capacity, and safety effects, along with the opportunities and challenges they pose to urban transportation. The study utilizes an index-based approach to measure resilience, involving five indicators as mentioned earlier. These indicators are then correlated with demographic variables to evaluate the resilience score of the twin city of Islamabad and Rawalpindi. Through a linear regression model analysis, the research identifies significant factors influencing the growth of ride-sourcing services. By examining these various indicators, the study pinpoints key elements that hinder the expansion of these services. Additionally, the research seeks to understand the public's perception of ride-sourcing services by using descriptive analysis on selected indicators. Overall, this study's findings are expected to provide valuable insights into resilient aspects of the urban context related to ride-sourcing services. It aims to enhance local-level actions and support future planning decisions for the development of these services.

Chapter -1- Introduction

1 Introduction:

In recent years, a new era of taxi management, “request dispatch sourcing,” has emerged, and some see it as a panacea that will change the transportation scene and solve the vehicle-related problems facing society. Transportation Network Organizations (TNCs) use calculations based on pickup areas to match travelers who need a ride with independent drivers. Drivers usually provide tours in private vehicles. Multinational corporations are extending their influence into more urban communities and are now among the richest and most important start-ups in the world. The expansion of ride-sharing provision administration has received a great deal of attention from academics in various fields and is being studied from various angles. Social research on ridesharing has focused on issues such as value and wealth, racial segregation, tensions between traditional taxis and multinational corporations, welfare and safety, and labor privilege. The financial research covered a variety of topics, including valuation, job and business creation, multinational competition, and skills.

Perceptions of sustainability are strongly associated with the sharing economy. Think about the powerful situation of idle/static resources engaging people to create experiences or declining economic activity. Overall, this is a significant sum considering the ability to develop new advertisements by reallocating idle assets that can reduce environmental availability. The information shows that there is approximately $5.35 trillion in various untapped assets that could be shared, devoured and traded internationally (what we know about the global sharing economy, 2021).

Among the sharing administrations, the instance of transportation, according to transportation network companies, is moving nowadays because of the inspiration of many individuals to secure the climate. Another inspiration is sociability. People try to make new encounters by meeting others (Park, Back, Bufquin, and Nutta, 2021). A significant factor that should be considered is the socio-demographic contrasts. Individuals who are younger or who have low pay are more persuaded to a financial point of view since they will probably want to save money. Thus, the inspiration of people to take an interest in sharing economy can differ contingent upon the country and the society where they are present. (Böcker and Meelen, 2017)

Transportation network organization (RIDE SOURCING SERVICES) is an arising retaliation to handling sustainability issues of metropolitan versatility with the benefits of unwavering quality and comfort. In any case, because of the broad turn of events and the absence of directing and overseeing experience, the sustainability of ride sourcing services administration

is confronting an incredible challenge. The nature of ride sourcing services administration is the center of the unwaveringness of clients. Understanding traveler fulfillment will assist ride sourcing Services with bettering potential client necessities and distinguish advancement angles for explicit market sections. It is additionally helpful for the arrangement making of the executives' divisions. Past investigations on traveler fulfillment assessment chiefly centered around transport, tram, and rail routes. Also, most of the examinations neglect to consider the straightforwardness and attainability of their outcomes in strategy making. The movement distance is a critical pointer for the advantages of drivers and ride sourcing Services and for the board offices to know the working status of the ride sourcing services administration in the city.

1.1 Ride sourcing services:

Ride-sourcing has become a subject of significant public interest due to its far-reaching impact on society. It presents both benefits and challenges worth considering. From a financial and environmental standpoint, ride-hailing services offer convenient and flexible transportation solutions, especially for urban dwellers. This aspect is particularly appealing to individuals with limited access to public transportation options. However, like any other business, rideshare companies must adhere to the legal regulations governing the societies in which they operate. This includes compliance with relevant transport regulations, licensing requirements, safety standards and other applicable laws. Ride-hailing services can further reduce vehicle ownership and use. This will have a positive effect on society. Additional analysis is available for ride-sharing provisioning services. One of the arguments is that ride sourcing increases congestion and therefore natural pollution. (Goletz and Bajamonde-Birke, 2021)

1.2 Origination of ride sourcing services:

- The concept of a transportation network company originated in developed countries. Following the successful implementation of carpooling services in these countries, the idea gained momentum and expanded globally. However, the unique and challenging characteristics of the sharing economy have led to inconsistent performance issues for ride-sharing services in non-industrial countries. Due to the inconvenient conditions, it is not possible to implement a grid company in the same manner as in developed countries.
- The various explanations for this problem are:
- Convenience of restricted assets.
- Assets are accessible, however, dispersed.

- There is an absence of awareness among individuals regarding acquiring the sharing culture. (Javaid, Javed and Kohda, 2019)

1.3 Problems of Transport in developing countries:

In addition to monetary and financial problems, developing countries also have social problems such as terrible transportation systems. Many people who must go to work always have to use public transport because they have no other choice. Public institutions are trying to satisfy the public's demands by introducing new traffic administrations. In the current situation, ride-sharing provisioning services play a pivotal role as they can tackle transportation frameworks and frame alternatives to sustainability.

1.4 Research Objectives:

This research comprises following objectives:

A) To measure the resilience of the ride sourcing services
B) To explore the barriers pertaining growth to the ride sourcing services
C) To identify the public's attitude towards the use of the ride sourcing services
D) To recommend strategies to enhance the resilience of ride sourcing services

1.5 Resilience in ride sourcing services perception:

Liu and Yang said that the sharing economy provides a pathway for people to practice a convenient lifestyle (Liu and Yang, 2018). Nadler and Brigenti believe that increasing the use of resources and assets in the sharing economy can increase efficiency in achieving comfort and sustainability for the people concerned. (Heinrichs, 2017)

At times, Careem encounters social issues that require attention. However, given resource constraints, the company may not be able to resolve the problems immediately. Instead, Careem plays a central role by connecting with partners and assisting them in initiating actions, serving as a crucial catalyst for achieving the ultimate goals. This cooperation is essential to ensure the sustainability of the framework for adequately responding to the issue.

Sustainable transport refers to any method for vehicles that are adapted and have a modest climate impact. Sustainable transport also means adjusting for current and future needs. Sustainable development is a daunting idea that relies on different translations as it encompasses several disciplines and potential interrelationships. (Geography of Transportation Systems, 2021).

Chapter -2- Literature Review

2 Literature Review

This section is subdivided into multiple subsections, focusing on subjective and quantitative outcomes. The impact of ridesharing services is examined through the Triple Bottom Line (TBL) approach, which considers social, economic, and environmental aspects as the core elements of sustainability. The effects of ridesharing administration are assessed in each of these key areas, and the results are categorized into positive and negative outcomes. The positive results are discussed first, followed by the negative ones.

2.1 Social

Positive Social Impacts

The Office of Resource Management has resolved many of the industry's past constraints, made many positive changes, and dramatically improved the quality of its support. The RIDE SOURCING service is claimed to offer a fast, adaptable, and beneficial portability option for those looking for fast highlight management with short acquisition times while avoiding the problem of riding.

In 2019, Tarabay and Abu Zayed demonstrated that the primary reasons motivating 66% to nearly 72% of individuals to switch from regular carpooling to carpool services in Beirut, Lebanon, were the shorter waiting times and faster administration process. However, it is essential to note that the study's participants were limited to college students, and their demographics may not represent the entire Bay Luch society accurately. From a spatial, temporal, and social perspective, these carpooling services have the potential to improve the accessibility of public transportation. Spatially, they can offer convenient mobility solutions to underserved and remote areas lacking proper public transportation. Additionally, a 2016 study conducted in San Francisco by Rayle, Dai, Chan, Cervero, and Shaheen revealed that carpooling helps overcome certain group travel restrictions, particularly for trips to and from less populated regions. A tentative view is that carpool administration may bridge the gaps between time caps and overtime, day and evening, weekends and non-weekends, windy days and sunny days in urban transport networks. There is The RIDE SOURCING service will improve portability by adopting powerful evaluation tools and encouraging drivers to work harder during peak hours, thus increasing taxi demand, especially towards the beginning of the day and towards the evening rush hour. corresponded to changes in Transport supply starts more quickly later in the evening when travel becomes less accessible and stopping there can

seem dangerous. Additionally, group travel does not allow for paperwork on weekends, so carpooling may be an option for some explorers, such as low-wage workers or those who do not own a car. This case is also true during stormy weather, when the need for portability management between homes increases. In 2020, Brodeur and Nield showed that windy hours were linked to an 18% increase in Lyft and Uber rides in New York, suggesting that interest in rideshare operations was essentially driven by increased rainfall. showed that it is related to Health authorities are providing social benefits by extending transport access to older people, especially those who cannot drive. Furthermore, it promotes a lifestyle free from car ownership, encourages a car-free approach, and opens up greater developmental prospects for seniors, reducing their reliance on companions and family members to fulfill their transportation requirements.

Customers and drivers of RIDE SOURCING SERVICE have superior safety tendencies when it comes to health and safety, unlike regular taxi drivers and drivers. Indeed, the tracking and scoring frameworks put in place by rideshare governing bodies have enhanced driver and passenger safety. Considering Gross et al.'s paper, reviews in London and San Francisco found that knowing certain data about the driver before starting the trip and checking contiguous areas of the vehicle during the lap increased passenger comfort. , I found that I experienced unwavering quality. . They added that driver registration, ratings and electronic vehicle tracking are helping female drivers gain a sense of safety and control. In addition, the advanced installment arrangements of rideshare management companies also prevent looting and injury to drivers.

Ride-sharing government efforts to eradicate drunk driving are also noteworthy. In some cases, particularly in the evening, the scarcity of taxis and generally high fares may motivate an alcoholic to drive. Hence, the convenience and flexibility of rideshare services play a crucial role in deterring individuals from driving under the influence of alcohol. Numerous studies support this assertion. For instance, according to a verified case by Uber, Mothers Against Drunk Driving (MADD) reported a reduction in the number of drunk drivers over the age of 30 in all U.S. cities where Uber operates. This finding is further supported by a comprehensive survey conducted by Lail et al., Clulow, and Mishra in the San Francisco and U.S. metropolitan regions, revealing that between 21% and 33% of individuals who chose to avoid a DUI record opted to use ridesharing platforms as a safer alternative to driving. There is substantial evidence indicating that the rideshare industry is linked to a decrease in car accidents, injuries, and fatalities in several regions. Dills and Mulholland conducted an analysis of U.S. zone-level data

from 2007 to 2015, revealing a correlation between the presence of Uber in the U.S. and a decline in fatal and severe road traffic accidents. Additionally, Kontou and McDonald reported that a 10% increase in rideshare usage might lead to a reduction of car crashes by up to 12% and driving impairment by 0.25%. However, their research did not find a significant association between the growth of rideshare services and the number of road deaths.

Negative Social Impacts

Previous research has found that access, utilization, and effectiveness of rideshare administration are geographically and socially disproportionate. This gives reason to obscure the claim that the rideshare administration can provide reasonable transportation and extend access to shared travel to non-princes and those living in congested areas. Geologically, ride-sharing administration is more prevalent in metropolitan and medium-sized areas with large urban communities and densely populated mixed land-use districts. Based on evidence from various cities in the U.S., Tehran, and Cairo, analysts concur that users of ride-sharing services tend to be disproportionately younger, more educated, and wealthier. However, non-exclusive carpooling services are claimed to be more expensive compared to public transportation. Their use is also dependent on mobile phones and Mastercard, which can pose financial barriers for low-wage workers. For instance, a study by Deka and Fei (2019) in the United States found that individuals earning $25,000 or less had significantly lower repeat rates for ride-sharing services compared to those earning $150,000 or more, highlighting the disparity in usage between low-wage workers and the wealthy. As more wealthy individuals shift from traditional transportation to carpooling, there may be potential implications for public support for travel subsidies. This could pose a challenge for low-wage individuals who heavily rely on transportation and may not be able to afford carpooling. This barrier becomes more pronounced during disruptions in travel, as low-wage minorities are less likely to choose carpooling as a public transportation option during mandatory outings. Some studies suggest that these ride-sharing services have not fully integrated and served the truly disadvantaged population. While certain laws mandate transportation providers to ensure accessibility and non-segregation, ride-sourcing services have often been exempt from such requirements. Additionally, real-world challenges, lack of comfort, and limited knowledge about innovative transportation options may deter seniors from adopting these new forms of transportation, as indicated by evidence in the U.S. (Mitra et al., 2019).

2.2 Economic

Positive Economic Impacts

Previous research has demonstrated that ridesharing services are disrupting traditional workforce norms and challenging outdated concepts, guidelines, and strategies, which can contribute to inequality and increased taxi costs. Unlike traditional taxis, which often charged a fixed rate regardless of peak or off-peak hours, ridesharing services employ dynamic pricing, commonly known as "surge pricing," which incentivizes drivers to work during high-demand periods and helps address the scarcity of taxis during rush hours. Ridesharing services have been shown to offer cheaper rides compared to regular taxis, allowing users to save on expenses such as fuel and parking while expanding their transportation options. Additionally, some researchers believe that these services can provide employment opportunities for the unemployed or individuals facing work difficulties, enabling them to participate in the labor market as professional or independent drivers. In China, Didi Chuxing attracts car owners to offer private rides, promoting a sharing economy approach. Evidence from studies, funded by Uber, estimated that a significant portion of Uber drivers were unemployed before joining the rideshare platform, illustrating the service's role in providing flexible working hours and employment opportunities. Moreover, ridesharing services have had a notable impact on the automotive industry, with evidence suggesting that Didi's lower-level service in China influenced the new car trade. Some studies point to the efforts made by carpooling services to collaborate with lenders, vehicle dealers, and drivers, encouraging them to purchase new vehicles rather than relying on existing ones. Overall, ridesharing services are seen as exemplifying flexibility in working hours, striking a balance between work and personal life, and catering to individuals with diverse lifestyles. However, the long-term effects of these services on various industries and employment patterns remain uncertain.

Negative Economic Impacts

The advent of ride-sharing services offers job opportunities for some, but it also raises concerns about precarious labor rights, underemployment, and wage instability. The ride-sharing industry lacks guarantees for workers' rights, potentially leading individuals to leave stable employment for less secure or less accessible positions. Moreover, the rise of ride-sharing administration has put a surplus of skilled and educated workers out of work. This is likely due to the less restrictive sections and the compelling quality of work in the progressive stages of innovation. Additionally, salaries are volatile in the industry, putting driver pay

security at risk. Although drivers cannot effectively increase their remuneration, the RIDE SOURCING service can change the rating framework without seeking the driver's opinion. There is also evidence to suggest that the wealthiest are forced to carpool. Obstacles such as moderately high expenses and the need for credit cards and mobile phones make low-wage workers reluctant to rideshare. Deca and Fay show that repeat use of rideshare management increases when salaries in the US exceed $50,000. They ensured that while carpool services were cheaper than taxis, they were generally far more exorbitant than public transport. Notary. published a comparison table of Uber and Grab drivers in Rangoon, Myanmar. Carpool Managers, which get a lot of attention for what they do, ensure that deeply talented and educated people can venture into new areas of work. The less affluent and less mobile, such as those who are uneducated and have no wireless connectivity, will not stay in this market.

2.3 Environmental

Positive Environmental Impacts

Consider the number of carpool government rides, energy consumption, ozone-depleting rides, road closure rates, and more. The significance of previous studies is evident as they highlight that carpooling services have both positive and negative effects on the environment. On the positive side, carpooling can effectively utilize existing vehicles, leading to a reduction in empty trips and overall distances traveled. This environmentally friendly approach poses no harm to the ecosystem. Additionally, ride-sharing operators have higher usage and fare limits compared to traditional taxi drivers, making their services more accessible to a wider range of users.

In the contrasting quality of taxi management and ride sourcing in Los Angeles, Braun and Laval found that customers of their ride sourcing service pay 40% less admission and wait just 5 times less than taxis of paddy field. Nie also shows that the RIDE SOURCING service can increase taxi usage during off-peak hours. This also applies to Pakistan.

Comparative results were obtained by Cramer and Krueger in a metropolitan community in the central United States, examining limited Uber driver usage by schedule and mileage. They found that Uber drivers were 30% more likely to use their time and doubled their mileage. They identify four factors that may account for this disparity. Firstly, RIDE SOURCING SERVICES drivers utilize innovations that cater better to both drivers and passengers. Secondly, the reach of RIDE SOURCING services surpasses that of traditional taxi organizations, resulting in quicker matching of drivers and passengers. Thirdly, the conventional taxi regulations often

prove inadequate for the dynamic nature of ride-sharing services. Lastly, RIDE SOURCING services' adaptable labor supply model, coupled with dynamic pricing, enables a closer alignment between supply and demand on a daily basis. The combination of carpooling and public transportation management has been argued to enhance the efficiency of the transportation system by addressing specific demands that public transport might not adequately fulfill. One positive effect of rideshare administration on public transportation is its potential to extend or complement existing public travel options. Overall travel distances can increase when carpools operate in areas where public transportation may not be sufficient. Rideshare provisioning can help bridge the first and last-mile gaps caused by limited routes and fixed schedules in public transportation systems, thereby enhancing the overall effectiveness of public travel.

The findings from Zgheib et al. reveal that integrating ridesharing services and coordinating them with public transportation could potentially increase Beirut's overall share of the Bus Rapid Transit (BRT) market by 2%. Moreover, they observed that reducing the price of RIDE SOURCING services by half could lead to a 3.5% increase in the BRT market share. However, it is important to note that their model is relatively basic and does not consider the interdependencies between various components. Additionally, residents in less urbanized areas often face challenges related to the first and last mile, as they encounter limitations with narrow travel routes for transportation options. The employment vectors that public procurement administrations can potentially play to complement and expand public transport encourage travel organizations and neighboring governments to launch on-demand frameworks that incorporate relevant multi-modal and coordinated transport frameworks. For example, the US Government Transportation Administration's sandbox program (FTA, Washington, DC, USA) supported a range of pilot applications in response to a demand task to combine the benefits of the first/ last mile and fixed routes. There is some evidence to suggest that the ride-sharing management industry contributes to a reduction in reliance on cars close to home. For example, after Uber and Lyft left Austin, Texas, Hampshire, etc., 45% of RIDE SOURCING service customers purchased a personal vehicle, and 8.9% of that group purchased an additional vehicle closer to home because of the suspension. know what I did. Nevertheless, it appears that some of the trend towards individual vehicles after the disruption may be reinforced by changes in travel behavior previously brought about by Uber and Lyft tasks. Similarly, this review assumes that former Uber and Lyft customers may have switched modes of transportation and that individuals may have switched to mixed mode use. Some reviews speculate that vehicle

ownership has declined due to the accessibility of ride-sharing management agencies. Among those who participated in the Henao and Marshall survey in the Denver area, 13% specified that they owned fewer cars because the ride-sharing agency was more accessible. They found that business outings to restaurants/bars, CBD, airport terminals, hostels, and event venues are the most important areas where individuals prefer to travel rather than drive. Ravieri et al. (2019) shows that 9% of respondents centered in Austin, TX typically give up at least one family vehicle due to the availability of ride-sharing lead agencies. Ride sourcing administrations can open an open door for organizers to limit leaving supply, make new land utilizes, and generally lessen vehicle miles voyaged (VMT). For some individuals, stopping is the principal motivation to substitute ride-sourcing for individual driving. Rideshare provisioning services can provide portability management to and from areas where the supply of stops is low because the rideshare driver does not have to search for stops. In this way, overall VMT can be mitigated by eliminating driving inefficiencies such as calls to stop near the end of an excursion. Henao and Marshall (2019) demonstrate that in the absence of these governments, approximately 26% of rideshare users would have driven a car if they needed a parking space in Denver. I am the. The development of ridesharing administrations could also be a step forward in reducing energy consumption congestion in urban communities. Erhard et al. We saved a few components where route supply management could reduce clogging. First, when the RIDE SOURCING service offers shared trips based on carpooling, it replaces trips that can be made in vehicles with fewer passengers. Second, travelers can use ridesharing management to process first and last mile associations with local transit agencies. Thus, the RIDE SOURCING service could allow travelers to replace car trips with trips. Finally, RIDE SOURCING services can harm vehicle ownership by providing attractive options as opposed to driving. These could lead to a reduction in the number of private vehicles and a shift to public and dynamic modes of transport. (Wenzel et al. 2019) acknowledges that governments responsible for carpooling can reduce energy consumption in several ways. In the meantime, allowing strangers to ride and pace are opportunities to mitigate VMT. This reduces the distance traveled and reduces the energy consumed by a few less busy vehicles. Second, transport service drivers may miss the underlying price expansion of more productive vehicles, as lower fuel costs may offset their medium-term expenses. Ultimately, in the long term, users can leave their current car to avoid fixed costs due to their need for versatility, thus canceling the trips they made in advance by car. (Jin et al. 2019) further point out that commonality of transport supply management can reduce energy consumption and metropolitan pollution if transport supply services only use driverless vehicles at online order. In general, the positive

effects of route supply management have proven to be more effective than traditional taxis. We identified several green possibilities in the documents we reviewed, such as increasing the efficiency of public transport, reducing the number of vehicle owners, limiting breakdowns, reducing congestion and using energy. However, there is no evidence that these opportunities have not yet been exploited.

Negative Environmental Impacts

The natural value of carpooling has been documented around the world, but the environmental impact of carpooling is unknown. In theory, RIDE SOURCING services can reduce VMT disruptions, energy consumption and air pollution, in general, by increasing the productivity of taxis and public transport. Nevertheless, they rejected this idea and argued that carpooling supply would increase idle vehicles on the streets, potentially attracting some open-minded travelers, so these administrations would be adverse to the city's mild climate. . Several studies (Xu et al. 2017) raise questions about the positive impact of trip sourcing on the public transport framework. A small number of travelers are said to have recently taken trips operated by Travel. Some of the excursions are also new releases, and I probably wouldn't do them anyway without the use of the ride supply.

In 2018, Clewlow and Mishra's research indicated that the introduction of RIDE SOURCING services led to a 15% decrease in ridership in major metropolitan areas in the United States. However, the impact varied across different types of public transportation, with open transport and light rail experiencing more significant declines, while heavy rail benefited from the emergence of this new taxi administration.

Initially, ride-sourcing services were seen as an alternative to traditional taxis. Mudassir Sheikha and Magnus Olsson founded the Careem service in 2012, initially offering company car reservations. However, over time, Careem evolved its business model and transformed into a transportation network company serving the Middle East region. (Virgin and Rush, 2014)

"*Careem is a brand that aims to simplify people's lives by revolutionizing the transportation industry. A brand that strives to inspire everyone to interact with and supports every person who dares to believe. A brand that exists to drive our region towards something better (Mudassir Sheikha)".*

In 2016, Mudassir Sheikha conceived the idea of launching Careem in Pakistan. However, this presented a significant challenge for him as Uber had already established its presence in various

cities across Pakistan. To gain attention and acceptance from the Pakistani society, Careem embarked on a mission to serve the public's welfare by offering opportunities for individuals to earn and avail benefits through their services.

Furthermore, in 2017, the company introduced a program to empower women in Pakistan. Recognizing the social and health reasons for women to prefer female drivers, Careem encouraged and enabled women to become drivers on their platform. Careem not only expanded its transportation network to numerous countries but also introduced the concept of ride-sharing to various societies where the concept was unfamiliar and people were unaware of its benefits. The company's ability to persuade diverse social segments to use Careem's services in a short span of time was a significant achievement for them. (Ride, Drive, Order Food and Pay with Careem, 2021).

Careem's primary goal in promoting sustainability is to listen and respond to the voice of society. To achieve this, Careem has established a learning environment that fosters a deeper understanding of societal issues and facilitates effective growth. In this nurturing setting, Careem instills a sense of empathy, encouraging all stakeholders, including employees, drivers, customers, and partners, to actively engage with diverse perspectives. By creating such an environment, Careem empowers and motivates everyone to work together towards a shared objective, fostering a culture of optimism and collaboration.

Ultimately, this conducive atmosphere promotes positive relationships, fosters a shared vision for Careem, and enables collective growth and enjoyment. Careem's approach aims to build a platform that supports a community culture through this learning environment, promoting sustainability through open dialogue and active participation from all stakeholders.

Another ride sourcing service, Uber, provides a source that connects drivers with riders. The motivation for Uber came when Travis Kalanick and Garrett Camp ended up caught in Paris on a cold evening, incapable of discovering a taxi. They asked themselves: "Consider the possibility that you could get a ride basically by tapping your telephone?" The organization was previously dispatched in 2009 and had been developing indeed since. Heading up a worldwide business with 16,000 representatives requires some genuine mastery. Fortunately, Khosrowshahi has that. Before appointing at Uber, he worked as the CEO of the online travel organization Expedia. Uber's head office s in San Francisco. However, there are additionally significant workplaces in London, Pakistan, Sao Paulo, Mexico City, and Amsterdam. You can

demand a ride with Uber in more than 600 urban areas around the world. (facts about the Uber story, 2021)

Drivers are driving the way towards a greener future, and Uber is focused on supporting them. Around the world, their Green Future program gives admittance to assets esteemed at $800 million to help countless drivers change to driving battery E.V.s by 2025 in Europe, the U.S., and Canada. Their Clean Air Plan for London has as of now rejuvenated this in the U.K., supporting each driver utilizing the Uber application in London to change to an electric vehicle by 2025. uber has additionally dedicated itself to contributing £5 million to E.V. charging foundation in underserved neighborhoods. (Uber, 2021)

No.	Category	Uber	Careem
1	Rides offered	4 ride services in Pakistan	5 ride services in Pakistan
2	Order a ride	Booking by app only	Booking by call, website, app
3	Ride options	Ride booking only "Now"	Ride booking "Now, later, repeat"
4	Payment method	Payment with only credit/debit card	Payment with cash, credit/debit card, and Careem wallet
5	Target group	Limited target group of customers (Middle class and rich)	Expanded target group of customers (Poor, middle class and rich)
6	Coverage area	Launched in 8+ big cities	Launched in 15+ small and big cities
7	Ride service	Profit based ride-hailing service	Social ride-hailing service (Profit + resolve social issues)
8	Market orientation	Focus on market needs	Focus on the market and social needs
9	Requirement(s) to be a driver	People who have a valid driving license and car ownership can become a driver	People who own a car or not can be a driver of Careem. But a valid driving license and supporting documentation is necessary
10	Work opportunity	Provide part-time work opportunity for the drivers	Provide part-time and full-time job opportunity for the drivers
11	Driver support	-	Careem supports its drivers to get easy loans and cars on leasing
12	Investors	Global investors	Global, local investors
13	Collaboration	-	Collaborate with 3rd parties to support drivers
14	Female driver	-	Promote female driver

Table 1. Difference between Uber and Careem

Beneficial, reasonable, and unsubsidized transportation is a decent pointer of its sustainability. Expanding transport costs and the financial strain can be deciphered as signs that they might be unreasonable. There are a few interrelated ways transportation frameworks can adjust to adapt to ship interest and arrive at a higher degree of sustainability. (Vickerman, 1993)

In executing under consideration situations and systems is a significant part of advancing supportable vehicles, these actions can be more viable when combined with transport supply enhancements. Transportation foundations ought to be extended to oblige quickly developing vehicle services. However long the worldwide metropolitan populace keeps on developing,

especially in developing economies, there are tensions to grow urban vehicle foundations and the framework supporting worldwide exchange. In urban regions, the test is to grow and further build transportation supply so the vehicle and shipping can have choices. For travelers, this can be accomplished by extending the public travel foundation, further developing existing general travel administrations, and making urban communities well-disposed to walkers and non-mechanized vehicles. Nonetheless, apparently vehicle computerization could be a much more powerful device by permitting better usage of the existing vehicle and street resources, just as lessening the number of cars available for use. (Gilbert, Richard, and Anthony Perl., 2021).

Chapter -3- Methodology

3 Methodology

This part is divided into a few subsections that give definite conversations on subjective and quantitative outcomes. By the Index base approach that sets social, economic, environmental, adaptive capacity and safety as five essential components for measuring resilience. Linear regression model is used to determine the factors pertaining growth of the ride sourcing services. Frequency analysis is used to determine the public's attitude towards the use of the ride sourcing services and after analyzing all the objectives the recommendations are provided to enhance the workability of these ride sourcing services.

Resilience assessment can be categorized into two distinct approaches: qualitative and subjective measures. Qualitative methods are employed to gain an understanding of underlying vulnerabilities, community capacity, and factors driving resilience. On the other hand, quantitative approaches aim to compare resilience across different geographical locations using indicators constructed from measurable traits.

Today, resilience holds significant importance and captivates the attention of the academic community. It offers valuable insights into complex socio-ecological systems and their sustainable management. Recognizing various obstacles, measuring resilience is considered a fundamental principle in devising management strategies and policies to foster resilient communities.

Researchers have proposed diverse methodologies and frameworks for measuring resilience, utilizing both qualitative and quantitative approaches at the community, regional, and national levels. Indices are valuable tools for subjectively quantifying resilience by combining multiple parameters into a composite index to assess the relative resilience of geographic units. However, some argue that solely using indices at higher management levels may overlook the inherent variability in unit performance at lower scales or management levels. As an alternative, Hinkel suggested that indicator-based assessments are more suitable at a regional scale where the system is more narrowly defined.

Decision-making processes and planning strategies must therefore consider resilience estimates at lower scales (such as city and district levels) to avoid being under-informed.

The Resilience Index (RI) serves as a tool to assess the resilience level of transportation services and aims to raise awareness of the current and future risks these services may face.

The results of this method will help establish an integrated and comprehensive management approach.

To quantitatively assess a city's resilience, the RI identifies five dimensions - physical, social, economic, adaptability, and security - which collectively provide a comprehensive picture of the current state of ride-hailing services. This approach not only focuses on human-centric factors but also takes into account the dynamics of institutions and their interaction with the environment and climate-related concepts.

Each RI parameter is rated on a scale of 1 to 5, representing poor to excellent performance. Respondents are then asked to select a ranking between 'worst' and 'best' for each parameter. Additionally, each variable for a given parameter should be ranked or weighted on a scale of 1 to 5 to reflect its level of importance. 1 means "not important", 5 means "very important".

The overall RI score for ride-hailing services is a simple average of the indicators for the five pillars of integrated urban development (Figure 1). When using a Likert scale, exponent values range from 1 to 5. Higher RI values indicate higher user satisfaction with these services.

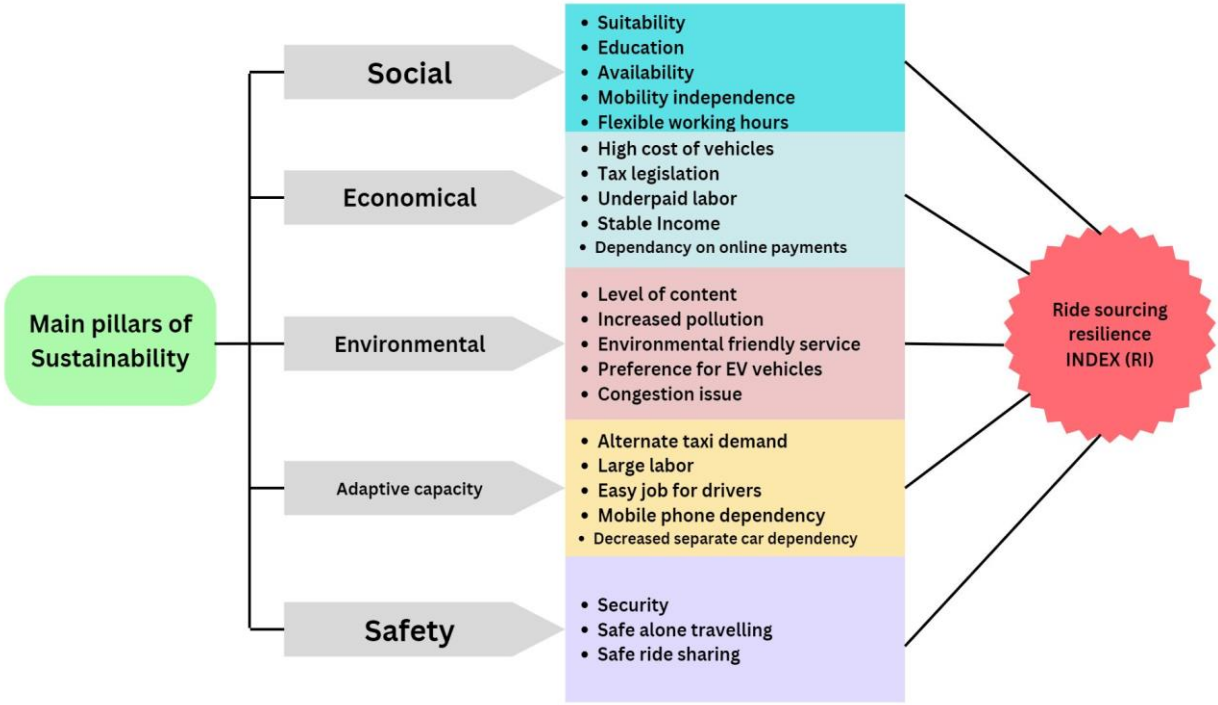

Figure 1. Schematic model to measure the resilience of ride sourcing services.

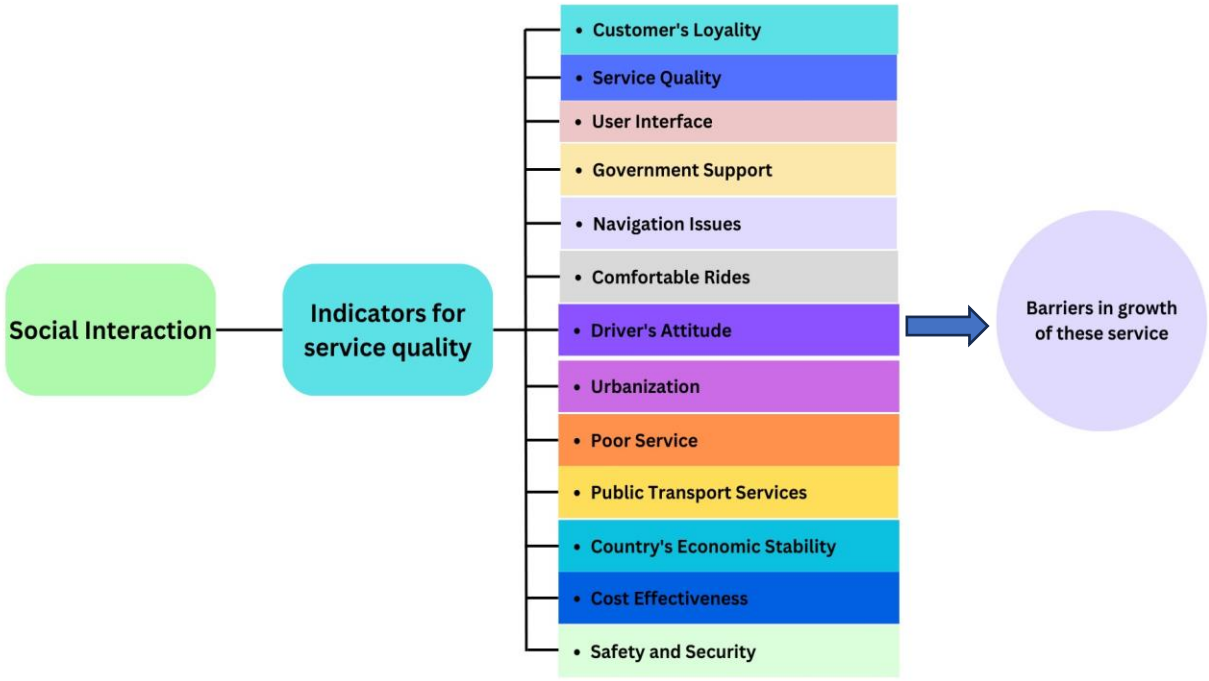

Figure 2. Schematic model to explore the barriers pertaining growth of the ride sourcing services

Adopting this approach makes it possible to investigate the spatial distribution and relative importance of resilience and to identify patterns of high and low resilience. Such information will guide future planning decisions and may prove invaluable in improving rideshare services in Pakistan. The results of the assessment will help design a more comprehensive and robust management plan. Measuring resilience at the zonal level can also facilitate targeted action at the local level, from the community level to the organizational level, leading to cost savings and increased effectiveness of proposed management strategies.

Sr No.	Questions	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1.	Do you think ride sourcing services are easy and suitable transportation options for every user?	SA	A	NS	DA	SDA
2.	Do you think ride sourcing services has made mobility/travelling inter-city easy for the people of all ages?	SA	A	NS	DA	SDA
3.	Do you think ride sourcing services has made mobility/travelling intra-city easy for the people of all ages?	SA	A	NS	DA	SDA
4.	Do you think ride sourcing services has enhanced the security for both passengers and drivers?	SA	A	NS	DA	SDA

Table 2. Sample of measuring the resilience of ride sourcing services questionnaire survey

3.1 Study Area

Islamabad city has a rapid transit service that is provided to occupants of twin cities of Rawalpindi and Islamabad. The whole area of Islamabad & Rawalpindi region was taken under study. The reason of selection of Rawalpindi & Islamabad region:

i. Twin Cities
ii. Largest Metropolitans,
iii. Several Gated Suburbs (e.g Bahria Town, DHA etc.),
iv. Connection with Pakistan's National Railway Network,
v. Connection with Islamabad International Airport with serving capacity of 9 million passengers/year,
vi. Civil Aviation Authority plans to extend the capacity to 25 million/year,
vii. Bus Rapid Transit System,
viii. 24 km (14.9 mi) of length,
ix. Serves both Cities,
x. 24 bus stations,
xi. Dedicated Bus Lanes.

This research was hybrid as both qualitative and quantitative data was accessed for the analysis.

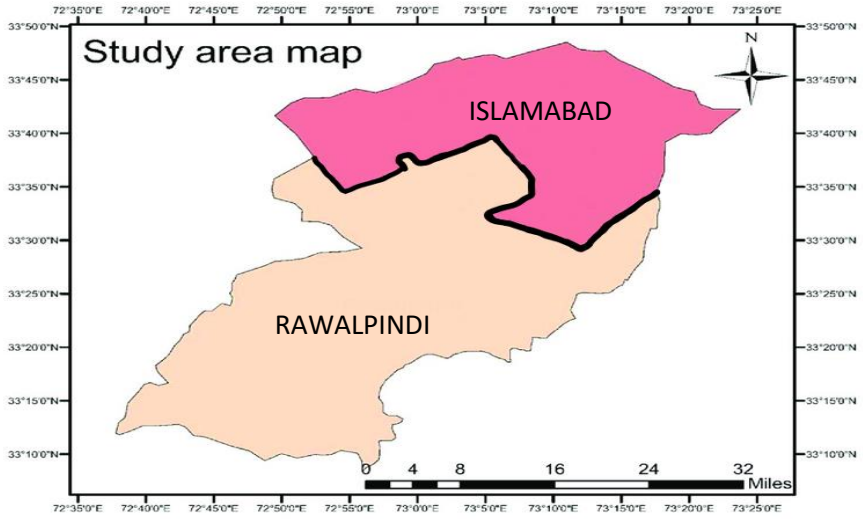

Figure 3. Geographic location study area

3.2 Resilience Index (RI)

The Resilience Index (RI) is an effective instrument for evaluating the resilience of ride-hailing services. Acknowledging diverse aspects of sustainability, including environmental quality, urban development, and adaptive capacity, the RI approach seeks to measure these aspects using various parameters and factors across different dimensions.

Resilience is assessed by considering five key dimensions: social, economic, environmental, security, and adaptive capacity. Each dimension comprises distinct parameters, and each parameter is further characterized by various variables.

Social resilience refers to the ability of a system or service to withstand and recover from social challenges and disruptions. When it comes to ride-sourcing services, social resilience can be assessed based on several factors such as accessibility and inclusivity, reliability and availability, safety and security, fairness and equity and community engagement.

Economic resilience refers to the ability of a system or service to withstand and recover from economic challenges and disruptions. When assessing the economic resilience of ride-sourcing services the factors to be considered are market competition, pricing and affordability, drivers earning and benefits, economic impacts on local communities and long-term sustainability. It's worth noting that the economic resilience of ride-sourcing services can be influenced by external factors such as economic recessions, shifts in consumer behavior, or regulatory changes. The ability to navigate and recover from such challenges while maintaining a stable economic foundation is a key aspect of economic resilience.

The environmental resilience indicates the ability of system to withstand and recover from environmental challenges and disruptions which includes the factors of vehicle emissions and fuel efficiency, congestion management, promoting shared mobility, support of alternative modes and environmental reporting and transparency. Whereas it is important to note that the environmental resilience of ride-sourcing services can vary depending on factors such as the vehicle types used, the availability of charging infrastructure for electric vehicles, local regulations, and consumer preferences. Continued efforts to reduce emissions, improve efficiency, and integrate with sustainable transportation systems are essential for enhancing the environmental resilience of ride-sourcing services.

Questionnaire surveys are a commonly used approach to collecting RI data, in which respondents are asked to use metrics to assign importance to variables and parameters that reflect their priorities for ride-hailing services. The IR for ridesharing services is a simple average of the above 5-dimensional indices.

As mentioned earlier, metric values range from 1 to 5, with higher IR values indicating greater satisfaction with a particular metric. However, it is important to understand that these results serve primarily as general policy guidance, not absolute values. The quality of results is determined by the accuracy and quality of the input data provided by survey respondents.

These indicators are considered a key component of urban management services and should strengthen the resilience and capacity of all urban systems.

The IR approach allows us to identify the strengths and weaknesses of each of the five aspects of VTC (car rental) supply services and their management units. Policy points and recommendations will then be developed, including the establishment of information platforms and capacity-building measures for these services.

The results obtained through the IR approach will be beneficial for municipal governments, offering valuable knowledge and information to other stakeholders with similar goals of enhancing and optimizing these services.

3.3 Linear Regression Model

Linear regression is a statistical modeling technique used to establish a relationship between a dependent variable (often denoted as "Y") and one or more independent variables (often denoted as "X"). The goal of linear regression is to find the best-fitting straight line (or hyperplane, in the case of multiple independent variables) that represents the relationship between the variables. This line is determined by minimizing the sum of the squared differences between the observed data points and the predicted values on the line, known as the "least squares" method.

The equation of a simple linear regression model with one independent variable is:

$$Y = \beta 0 + \beta 1 * X + \varepsilon$$

where:

Y is the dependent variable (the variable being predicted).

X is the independent variable (the predictor variable).

β0 is the y-intercept of the regression line.

β1 is the slope of the regression line, representing the change in Y for a one-unit change in X.

ε is the error term or residual, representing the difference between the observed Y and the predicted Y.

The coefficients (β0 and β1) of the linear regression model are estimated during the model fitting process. The goal is to find the values of β0 and β1 that minimize the sum of squared residuals, indicating the line that best fits the data.

To develop a linear regression model, one typically uses a dataset with observed values for both the dependent and independent variables. The model is trained using the data, and the

coefficients are estimated to find the best-fitting line. Once the model is trained, it can be used to make predictions for new data points based on their independent variable values.

It's worth noting that linear regression assumes a linear relationship between the dependent and independent variables. If the relationship is more complex, other regression techniques like polynomial regression or non-linear regression may be more appropriate. Additionally, it's essential to check for assumptions of linear regression, such as the normality of residuals and constant variance, to ensure the validity of the model's results.

3.4 Frequency Analysis

Frequency analysis is a statistical technique used to study the occurrence and distribution of items or patterns in a dataset. This involves counting the number of times each item occurs and organizing that information into a frequency chart or graph. Analyzing frequency reveals patterns and trends in data, providing valuable insights and helping decision-making in many areas.

Cryptography uses frequency analysis to break simple encryption techniques by analyzing the occurrences of letters or symbols in the ciphertext. Linguistics and natural language processing use frequency analysis to identify common words, phrases, or n-grams in a corpus of text. Signal processing allows you to identify the frequency components in your signal. In market research, frequency analysis examines the prevalence of different opinions and preferences among respondents. Additionally, in genetics, it is used to study the existence of specific genetic variations within a population.

Frequency analysis involves collecting data, counting occurrences, organizing the data into frequency tables, and visualizing the results using histograms, bar charts, or pie charts. It is a fundamental tool for exploring data patterns, detecting anomalies, and summarizing information, and is applicable across a wide range of disciplines and areas of research..

3.5 Research Instruments

Several different measures were employed in this study. These measures have been adopted for their relevance to research after various reports, review articles and a review of the literature of previous approaches. These indicators were used to develop the field survey questionnaire. The indicators considered to measure resilience are social, environmental, economic, adaptive capacity and security. In the meantime, other indicators related to these have also been taken into account. The data collected from these indicators was assessed using an index approach.

3.6 Data Collection

Following the establishment of a comprehensive and detailed methodological approach for conducting the field study, the subsequent step involved data collection.

3.6.1 Primary Data Collection

The collection of primary data was conducted using the following data collection methods:

- Field Survey (Personally)
- Survey Feedback forms (Online)

Field survey was conducted along the different regions so that basic characteristics of the study area can be identified and analyzed. Respondents were required to assess parameters using a 5-point Likert scale, where 1 represented the lowest rating/value, and 5 denoted the highest rating/value. In essence, each parameter was evaluated using five choices, ranging from 1 (poor) to 5 (excellent).

3.7 Sample Size

A questionnaire was developed with a total sample size of 400. There were 325 questionnaires which were selected and others were rejected due to in complete data.

The survey points were taken alternatively, and equal sample size was collected from different parts of the cities. Data was then collected through Questionnaire surveys from the concerned users.

Demographic data of respondants	
Variables	***Percentage***
Gender	
Male	51.4
Female	48.6
Marital Status	
Married	30.7
Unmarried	69.3
Occupation	
Working	19
Student	81
Age	
Below 20	15.6
Between 20 & 30	77.7
Above 30	6.7
Education	
Intermediate	10.1
Under graduate	59.8
Post Graduate	30.2
Number of Adults in each household	
No Adults	1.7
Between 1 to 3 Adults	39.1
Between 4 to 6 Adults	49.2
More than 6 Adults	10.1
Number of children in each household	
No children	34.6
Between 1 to 3 children	55.3
More than 3 Children	10.1
Number of working adults in their household	
No working adults	10.1
Between 1 to 3 working adults	81.6
More than 3 working adults	8.4
Number of cars in their household	
No cars	20.7
Between 1 to 3 cars	76
More than 3 cars	3.4
Number of motorbikes in their household	
No motorbikes	16.8
Between 1 to 3 motorbikes	81.6
More than 3 motorbikes	1.7
Number of bicycles in their household	
No Bicycles	76
Between 1 to 3 Bicycles	22.3
More than 3 Bicycles	1.7
Household Income	
Below 50,000	12.3
50,000 to 1,30,000	37.4
1,30,000 to 2,00,000	25.7
2,00,000 above	24.6
Individual Income	
Below 25000	39.7
Between 25,000 to 80,000	34.1
80,000 to 1,30,000	17.3
1,30,000 Above	8.9
Frequency of usage per week	
7 times a week	78.8
7 to 14 times a week	19
More than 14 times a week	2.2

Table 3. Demographic Information of Respondents.

Chapter -4- Data Analysis

4 Data Analysis

This part includes the analysis of collected primary and secondary data. Data collected from all sources were compiled and analyzed using software such as Microsoft Office, Microsoft Excel and SPSS (Social Science Statistical Package). This includes analyzes such as averages, averages, percentages and crosstabs.

To better describe the concept of the RI, an **Index Based approach** was applied. Initially, all the values of indicators were normalized using the formula of normalization = ($\frac{max-X}{max-min}$) for each set of value and then reliability of each indicator was checked using the SPSS in which the table showing the negative value of variable shows the unwanted or weak indicators from data set which must be deleted. After normalization, mean of these indicators were applied using SPSS which created social resilience indicator (SRI = $\frac{\sum SS}{n}$), Economic resilience indicator (ERI = $\frac{\sum EC}{n}$), environmental resilience indicator (EVRI = $\frac{\sum EV}{n}$), safety resilience indicator (SFRI = $\frac{\sum SF}{n}$) and adaptive capacity resilience indicator (ACRI = $\frac{\sum AC}{n}$).

The calculated value of MI in a dimension is the RI in that dimension as shown above. Subsequently, the final score for each parameter was calculated accordingly, and the average formula was applied to generate the Resilience Index (RI).

$$RI = \frac{\sum(SRI+ERI+EVRI+SFRI+ACRI)}{n=5}$$

where n = No. of indicators.

Overall, the RI value was obtained after averaging the repulsive force values for each of the five dimensions.

Generally, the **Linear Regression Model** is specified thus:

$$y = f(x_1, x_2, x_3, x_4, x_5)$$

where y is the dependent variable (pertaining growth); and

x_{1-n} is for the independent variables (determinants);

$$y = \beta 0 + \beta 1 x_1 + \beta 2 x_2 + \beta 3 x_3 + \beta 4 x_4 + \beta 5 x_5$$

where y is pertaining growth indicators.

x_1 is the Social indicators;

x_2 is Economic Indicators;

x_3 is Environmental Indicators;

x_4 is Adaptive capacity Indicators; and

x_5 is the safety indicator.

Chapter -5- Results and Discussion

5 Results and discussion

An analysis of the RI scores using different dimensions revealed that maximum people think that ride sourcing services are average resilient in all 5 variables.

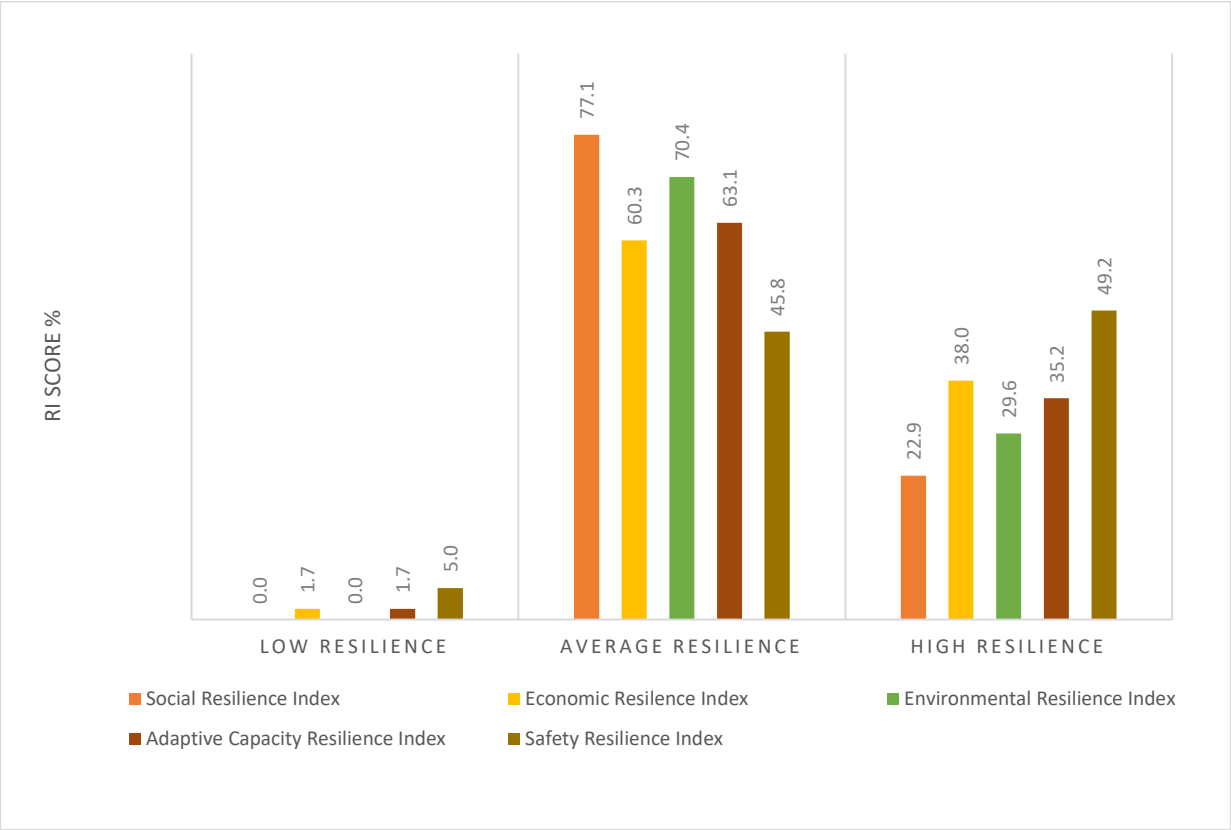

Figure 4. Resilience index of all variables.

5.1 Social Resilience:

Based on the information provided, the graph shows that 0% of respondents consider ride-hailing provisioning services to be less socially resilient. This indicates that no respondents perceive the social resilience of ride-hailing provisioning services to be low. This means that respondents do not believe these services are struggling to maintain social connections and community support. 77.1% of respondents believe that ride-hailing services are moderately resilient. This suggests that most respondents consider rideshare services to be moderately socially resilient. They may perceive that these services can maintain some degree of social connection and community support. 22.9% of respondents believe their ride provisioning services are very resilient. This segment of respondents is of the opinion that ridesharing provisioning services have a high level of social resilience. Perhaps they think these services are great at maintaining social connections and community support. Based on the information

provided, the graph shows that 0% of respondents consider rideshare services to be less socially resilient. This indicates that no respondents perceive the social resilience of ride-hailing provisioning services to be low. This means that respondents do not believe these services are struggling to maintain social connections and community support. 77.1% of respondents believe that ride-hailing services are moderately resilient. This suggests that most respondents consider rideshare services to be moderately socially resilient. They may perceive that these services can maintain some degree of social connection and community support. 22.9% of respondents believe their ride provisioning services are very resilient. This segment of respondents is of the opinion that ridesharing provisioning services have a high level of social resilience. Perhaps they think these services are great at maintaining social connections and community support.

5.2 Economic Resilience:

In the chart above, 1.7% of respondents believe ride-hailing provisioning services are not economically resilient. This indicates that a minority of respondents perceive ride-hailing provisioning services as less economically resilient. Perhaps they think these services may struggle to weather economic turmoil and economic challenges. 60.3% of respondents believe that ride hailing services are economically resilient. This suggests that most respondents believe ride-hailing procurement services have moderate economic resilience. They may perceive that these services can cope with some degree of economic disruption, but may have limitations in addressing larger economic challenges. 38.0% of respondents believe that ridesharing provision services are very economically resilient. This segment of respondents are of the opinion that ridesharing provision services have a high level of economic resilience. Perhaps they believe that these services can effectively weather and recover from various disruptions and economic challenges.

5.3 Environmental Resilience:

0% of respondents believe that ride-hailing services have poor environmental flexibility. This indicates that none of the respondents considered ride-hailing services to be environmentally tolerant. This suggests that respondents do not believe these services will be affected by disruptions or environmental issues. 70.4% of respondents believe that ride-hailing services are green on average. Most respondents believe that ride-hailing services have an average level of environmental flexibility. They may recognize that these services can address some of their environmental constraints, but may be limited in addressing more pressing

environmental challenges. 29.6% of respondents believe that ride-hailing services are more environmentally tolerant. This segment of interviewees believes that ride-hailing services offer a high level of environmental flexibility. They probably believe that these services can effectively address and adapt to various environmental constraints and challenges.

5.4 Adaptive capacity Resilience:

1.7% of respondents believe that ride-hailing services are less flexible. This indicates that a minority of respondents perceive limited ability to adapt to changing conditions and challenges of ride-hailing logistics services. 63.1% respondents believe that ride-hailing services have moderate flexibility. This indicates that most of the respondents consider ride-hailing contract services to be relatively compatible. They may recognize that although these services are somewhat adaptable, they may have limitations in dealing with more complex or rapidly changing situations. 35.2% respondents believe that ride hailing services are very flexible and flexible. Respondents in this section believe that ride sourcing services have a high level of adaptability. You might think that these services can effectively adapt to various challenges and changing situations.

5.5 Safety Resilience:

5% of respondents believe that ride-hailing services are unsafe. This indicates that a small proportion of respondents consider transport services to be less flexible for safety. They believe that the service has weaknesses and vulnerabilities to ensure the safety of passengers and drivers. 45.8% of respondents believe that ride-hailing services have moderate security flexibility. This shows that a significant portion of respondents consider ride-hailing services to have moderate security flexibility. They may consider these services generally safe, but there may be room for improvement to ensure their safety. 49.2% of respondents believe that ride-hailing services are very safe. Respondents in this segment opined that ride-hailing services have high safety flexibility. They understand that these services prioritize safety measures and have effective systems to ensure the health of passengers and drivers.

5.6 Co-relation between RI and demographic features:

The overall RI of the ride sourcing services was used to cross-tabulate with key demographic characteristics of the respondents. This crosstab allows you to compare the distribution of resilience ratings across different demographic groups. Understanding the preferences and satisfaction levels of different demographic groups is beneficial for ride-hailing service providers. By identifying the strengths and weaknesses of your service, you can

tailor it to better meet the needs of your target audience, ultimately increasing customer loyalty and expanding your user base.

5.6.1 RI based on Age:

Figure 5. Resilience index crosstab with age of respondents.

Interestingly, none of the respondents rated the ride-hailing sourcing service as less resilient, indicating a generally positive perception of service resilience across all age groups. I'm here.

The data shows that respondents in their 20s and 30s are highly satisfied with ride-hailing sourcing services, with 55.9% believing they are moderately resilient and 21.8% believing they are highly resilient. recognizing. This observation suggests that young people, such as students and office workers, are important users of ride-hailing sourcing services and are satisfied with the service's performance.

Additionally, the data points to opportunities for improving service quality. Most respondents in this age group consider themselves to be moderately resilient, but a notable proportion still consider themselves highly resilient. This shows that the ride-hailing sourcing service has the potential for growth and enhancement to meet the expectations and demands of this user base.

5.6.2 RI based on Household Income per month:

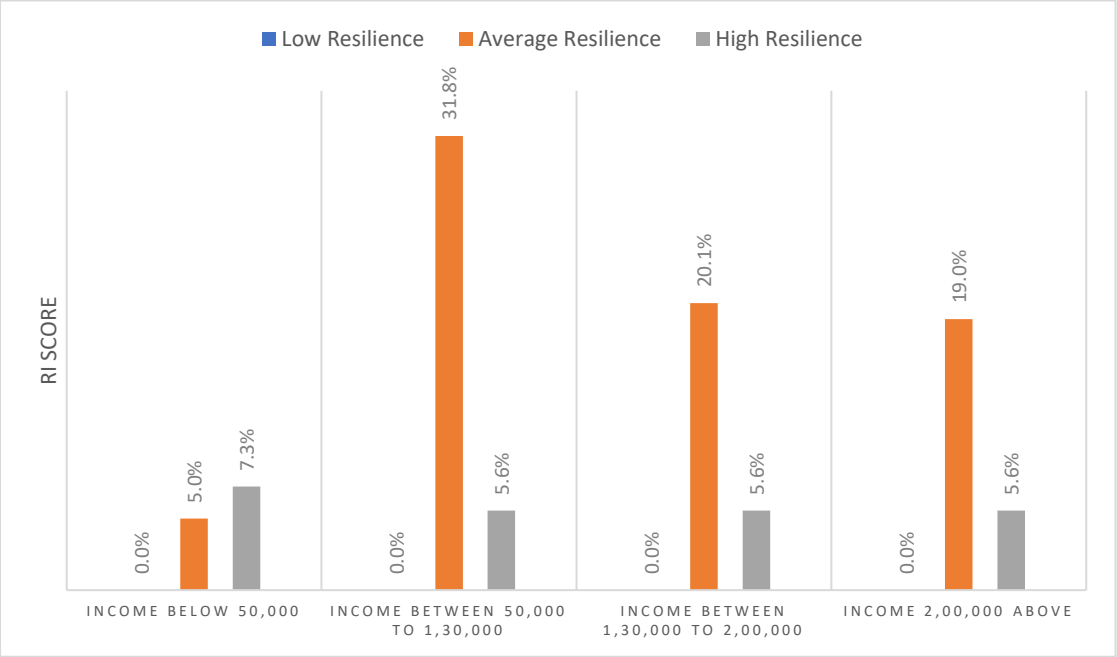

Figure 6. Resilience index crosstab with household income per month.

Again, no respondents in any income category believe that ride-hailing sourcing services are less resilient. Notably, no respondents rated ride-hailing sourcing services as less resilient in any income category. This demonstrates a consistent positive sentiment towards service resilience across all income groups.

Of respondents with a monthly income of less than her 50,000, 5% perceive ride-hailing sourcing services to be moderately resilient, and 7.3% believe the service is highly resilient. This shows that even low-income people find the service reliable and satisfactory. This indicates that the ride-hailing sourcing service is accessible and affordable for middle-income households, who said they were generally satisfied with the service's performance.

In the 50,000 to 130,000 income category, 31.8% of respondents consider ride-hailing sourcing services to be moderately resilient, while 5.6% believe they are highly resilient. The findings indicate that a significant proportion of users within this income range feel satisfied with the service, although there is room for improvement to increase perceptions of resilience.

Overall, the data suggests that most respondents across all income categories perceive ride-hailing sourcing services as having average resilience. This indicates a generally positive sentiment towards the service. However, this also highlights an opportunity for ride-hailing sourcing service his providers to make their services even more resilient to meet user expectations and preferences, especially in terms of making their services more resilient.

By leveraging these insights, ride-hailing sourcing service providers can improve their service delivery by improving reliability, addressing potential issues, and implementing measures to improve overall resilience and user experience. can concentrate on This will further enhance user satisfaction and loyalty across different income groups, leading to sustained growth and success in the market.

5.6.3 RI based on education:

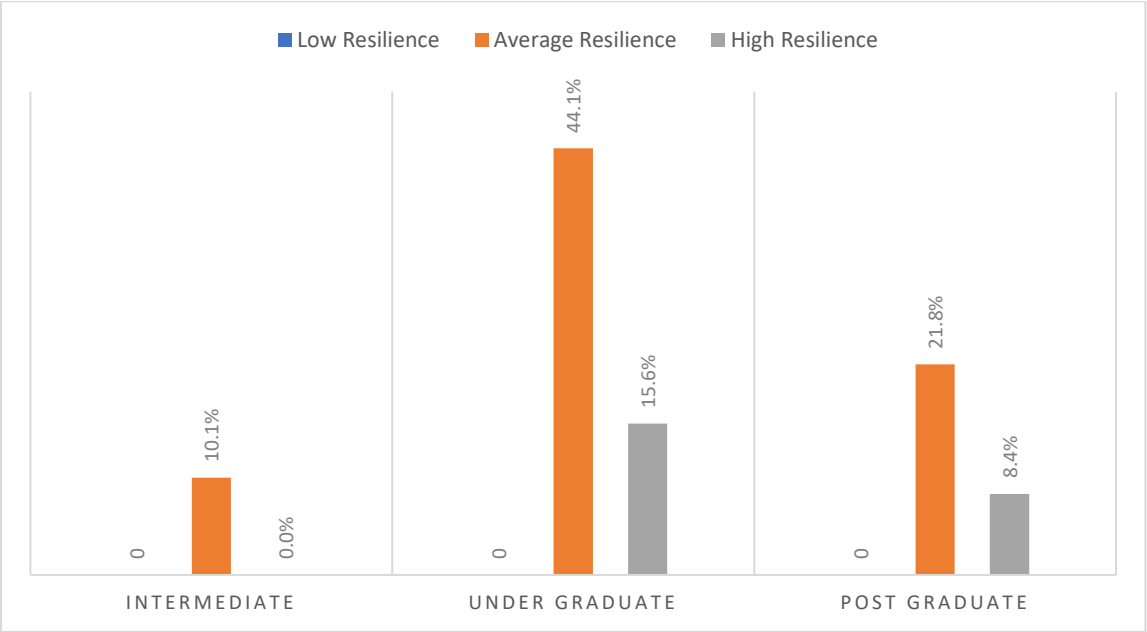

Figure 7. Resilience index crosstab with education.

According to the data, college students found ride-hailing services on average 44.1 percent more flexible and 15.6 percent less flexible. This indicates that although a significant percentage of students are satisfied with the service, there is room for improvement in improving flexibility.

Among average students, 10.1% consider ride-hailing services to be moderately flexible. This shows that this group is relatively less satisfied than the students.

On the other hand, graduate students, on average, find their ride-hailing services 21.8 percent and 8.4 percent more flexible. This shows that a significant proportion of graduate students are satisfied with the service and the satisfaction is slightly higher than that of secondary students.

Overall, the data shows that the majority of students at all educational levels find ride sourcing services moderately flexible. This means that there is a general sense that services can be further improved to meet student expectations. This highlights an opportunity for ride sourcing

service providers to address all concerns and improve service flexibility to better meet the needs of this user segment.

5.6.4 RI based on weekly usage frequency:

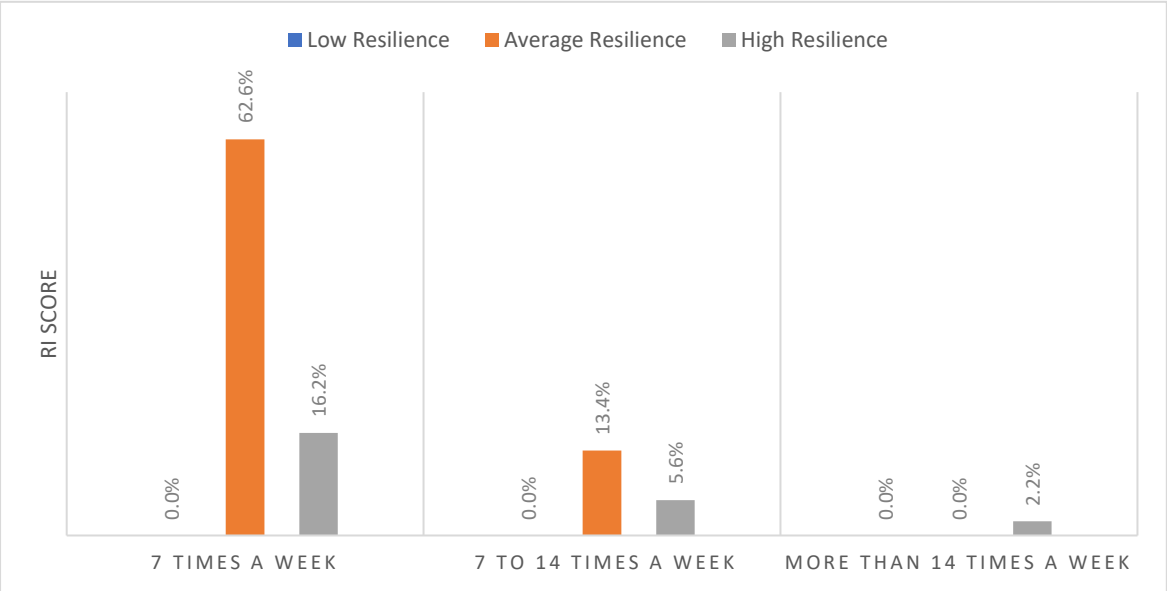

Figure 8. Resilience index crosstab with weekly usage frequency

When RI was associated with respondents' weekly frequency of use. According to statistics, 62.6% of users who use his sourcing service 7 times a week think of medium flexibility and 16.2% think of high flexibility. This indicates that frequent users are highly satisfied with the service, and that it is a reliable and flexible service.

However, users who used ride-hailing services 7-14 times a week were less likely to perceive their ride-hailing services to be reasonably flexible, a perception he decreased by 13.4%. Only 5.6% of these users consider the service to be flexible. The findings indicate that these users' average perception of flexibility decreases as their frequency of use increases.

Furthermore, for users who use the ride-hailing service more than 14 times a week, his perception of flexibility drops significantly to 2.2%. This suggests that frequent users may have higher expectations and harsher evaluations of service flexibility.

Overall, the data shows that users who use the sourcing service once a day, whether students or business owners, are more likely to rate the service as moderately flexible. increase. This indicates that the service meets the expectations of a specific user segment that relies on their daily transportation needs.

Understanding these patterns allows sourcing service providers to focus on meeting the needs and expectations of different user segments based on usage frequency. This may include implementing measures to improve the resilience and reliability of our services, addressing specific concerns for heavy users, and ensuring a consistently positive experience for all users.

5.6.5 RI based on gender:

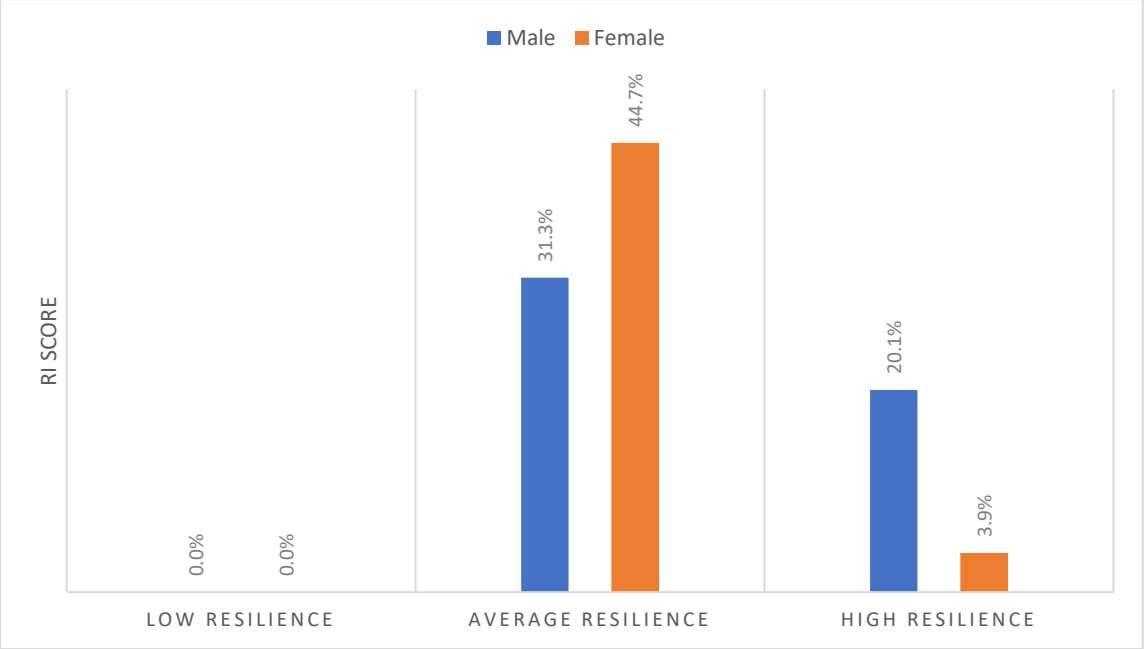

Figure 9. Resilience index crosstab with gender.

Based on the data, 31.3% of male respondents believe that taxi procurement services are somewhat flexible and 44.7% of female respondents share the same opinion. This shows that a significant percentage of men and women feel satisfied and flexible with the service.

Furthermore, 20.1% of male respondents believe that taxi procurement services are more flexible, with 3.9% of female respondents sharing this opinion. This suggests that a proportion of male respondents perceive services as more flexible than female respondents.

Furthermore, the graph reveals that none of the respondents, regardless of gender, believe their taxi provisioning services are less flexible. This indicates that both men and women have consistently positive feelings about service flexibility.

Based on these data, it can be inferred that the women interviewed prefer ride-hailing provisioning services and perceive the service as flexible on average. This highlights the positive perception and satisfaction among female users.

By recognizing and responding to the needs and preferences of both male and female users, ride-hailing procurement service providers can continue to foster positive user experiences and enhance their reputation in the marketplace.

5.6.6 RI based on occupation:

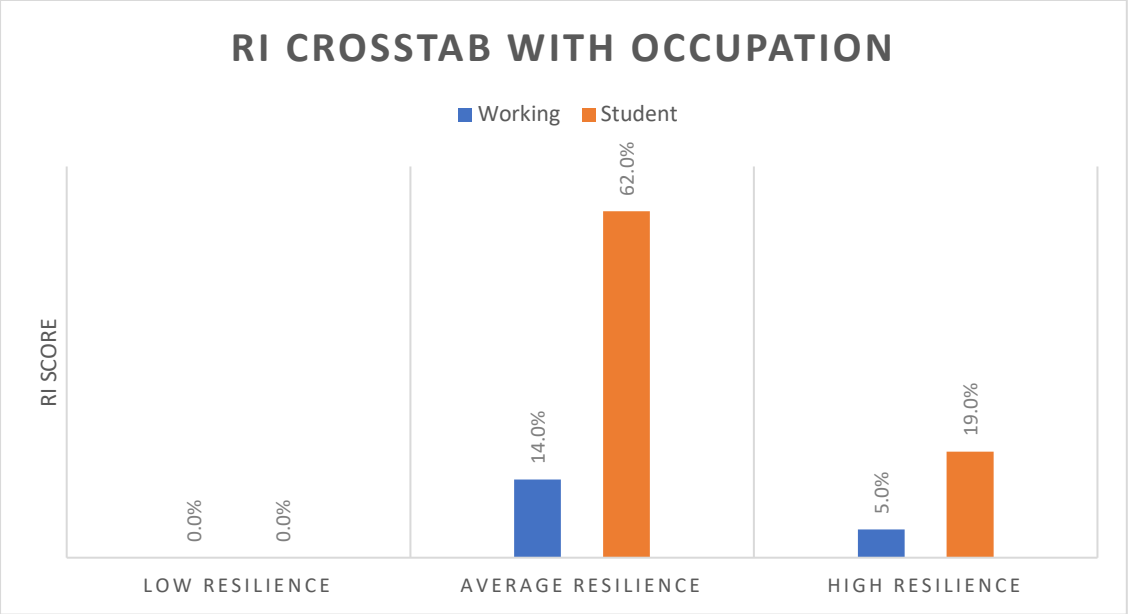

Figure 10. Resilience index crosstab with occupation.

According to the data, 62.0% of students consider the ride-hailing service to be reasonably flexible, indicating that most student users are satisfied with this level of service. Additionally, 19.0% of students find the service very flexible. This indicates that a significant percentage of student users are very satisfied.

Among respondents working in a variety of industries in the region, 14.0% believe that vehicle purchasing services offer some flexibility, indicating lower levels of employee satisfaction. I'm here. Only 5% of respondents consider the service to be very flexible. This indicates that a small percentage of working respondents consider these services to be highly flexible.

Data show that students represent an important user group for ride-hailing services, with a high percentage rating the service as moderate to very flexible. This indicates that the service is popular among students and generally meets their expectations.

On the other hand, data shows that relatively few workers use ride-hailing services. Note, however, that this conclusion is based on the specific sample and region of the data presented.

5.6.7 Overall Linear Regression Model With RI:

Model	Standardized Coefficients	t-test	Sig.ρ-Value
(Constant)		3.280	.001
Social Indicators	.094	1.234	.219
Economical Indicators	.122	1.734	.085
Environmental Indicators	.372	4.688	.000
Adaptive Capacity Indicators	.115	1.562	.120
Safety Indicators	.076	1.061	.290
R	.608		
R^2	.370		

a. Dependent Variable: Pertaining Growth Indicators

Table 4. Overall Linear Regression Model with RI.

This table presents the results of a regression analysis of the determinants related to the growth of ride-hail services. In the linear regression analysis of the application, the beta coefficient shows the change in the dependent variable, which indicates the corresponding unit change in the independent variable. The value of R2 indicates the magnitude of change in the dependent variable (Hair et al., 2009). The model preview shows an R2 value of 0.370. This means that the independent predictors of social, economic, environmental, adaptability and security indicators account for 37% of the total variance of the dependent variable of customer satisfaction. The social index showed a positive beta coefficient (0.094 and 0.219 at the 1% significance level). Economic indicators for the beta coefficient showed a positive value (0.122 at a significance level of 1% 0.085). The environmental index value showed a positive value for the beta coefficient (0.372, 1% significance level 0.000). Also, the adaptive capacity index also showed a positive beta coefficient (0.115, 0.120 at the 1% significance level). Finally, the safety index obtained a beta coefficient value (0.076 at the 1% significance level of 0.290).

5.6.8 Linear Regression Model with Social Indicators:

Model	Standardized Coefficients	t-test	Sig.ρ-Value
(Constant)		11.404	.000
Social Indicators	.407	5.924	.000
R	.407		
R^2	.165		

a. Dependent Variable: Pertaining Growth Indicators

Table 5. Linear Regression Model with Social Indicators.

The model preview shows an R2 value of 0.165. This means that independent predictors of the social index account for 16.5% of the total variation in the growth dependent variable. The social index showed a positive beta (0.407, 1% significance level 0.000).

5.6.9 Linear Regression Model with Economic Indicators:

Model	Standardized Coefficients	t-test	Sig.ρ-Value
(Constant)		9.691	.000
Economical Indicators	.387	5.582	.000
R	.387[a]		
R^2	.150		

a. Dependent Variable: Pertaining Growth Indicators

Table 6. Linear Regression Model with Economic Indicators.

The model preview shows an R2 value of 0.150. This means that independent predictors of economic indicators account for 15.0% of the total variance of their respective growth dependent variables. The beta coefficient of economic indicators showed a positive value (0.387, 0.000 at the 1% significance level).

5.6.10 Linear Regression Model with Environmental Indicators:

Model	Standardized Coefficients	t-test	Sig.ρ-Value
(Constant)		6.857	.000
Environmental Indicators	.563	9.055	.000
R	.563[a]		
R^2	.317		

a. Dependent Variable: Pertaining Growth Indicators

Table 7. Linear Regression Model with Environmental Indicators.

The model preview shows an R2 value of 0.317. This means that 31.7% of the total variation in the dependent development dependent variable is an independent predictor of the environmental index. Environmental indicator β coefficient is positive (0.563, 1% significance level 0.000).

5.6.11 Linear Regression Model with Adaptive Capacity Indicators:

Model	Standardized Coefficients	t-test	Sig.ρ-Value
(Constant)		7.312	.000
AdaptiveCapacity Indicators	.420	6.159	.000
R	.420[a]		
R^2	.176		

a. Dependent Variable: Pertaining Growth Indicators

Table 8. Linear Regression Model with Adaptive Capacity Indicators.

The preview of the model shows an R2 value of 0.176. This means that the independent predictor of the adaptive capacity index explains 17.6% of the total variation in the relevant growth dependent variables. The adaptive capacity index showed a positive beta coefficient (0.420, 0.000 at 1% significance level).

5.6.12 Linear Regression Model with Safety Indicators:

Model	Standardized Coefficients	t-test	Sig.ρ-Value
(Constant)		14.205	.000
Safety Indicators	.356	5.061	.000
R	.356[a]		
R^2	.126		

a. Dependent Variable: Pertaining Growth Indicators

Table 9. Linear Regression Model with Safety Indicators.

Table 10. Linear Regression Model with Safety Indicators.

The model preview shows an R2 value of 0.126. This means that there is an independent predictor of safety index for 12.6% of the total variation of the relevant growth dependent variables. The safety index yielded a positive beta coefficient (0.356, 0.000 at the 1% significance level).

5.6.13 Frequency Analysis:

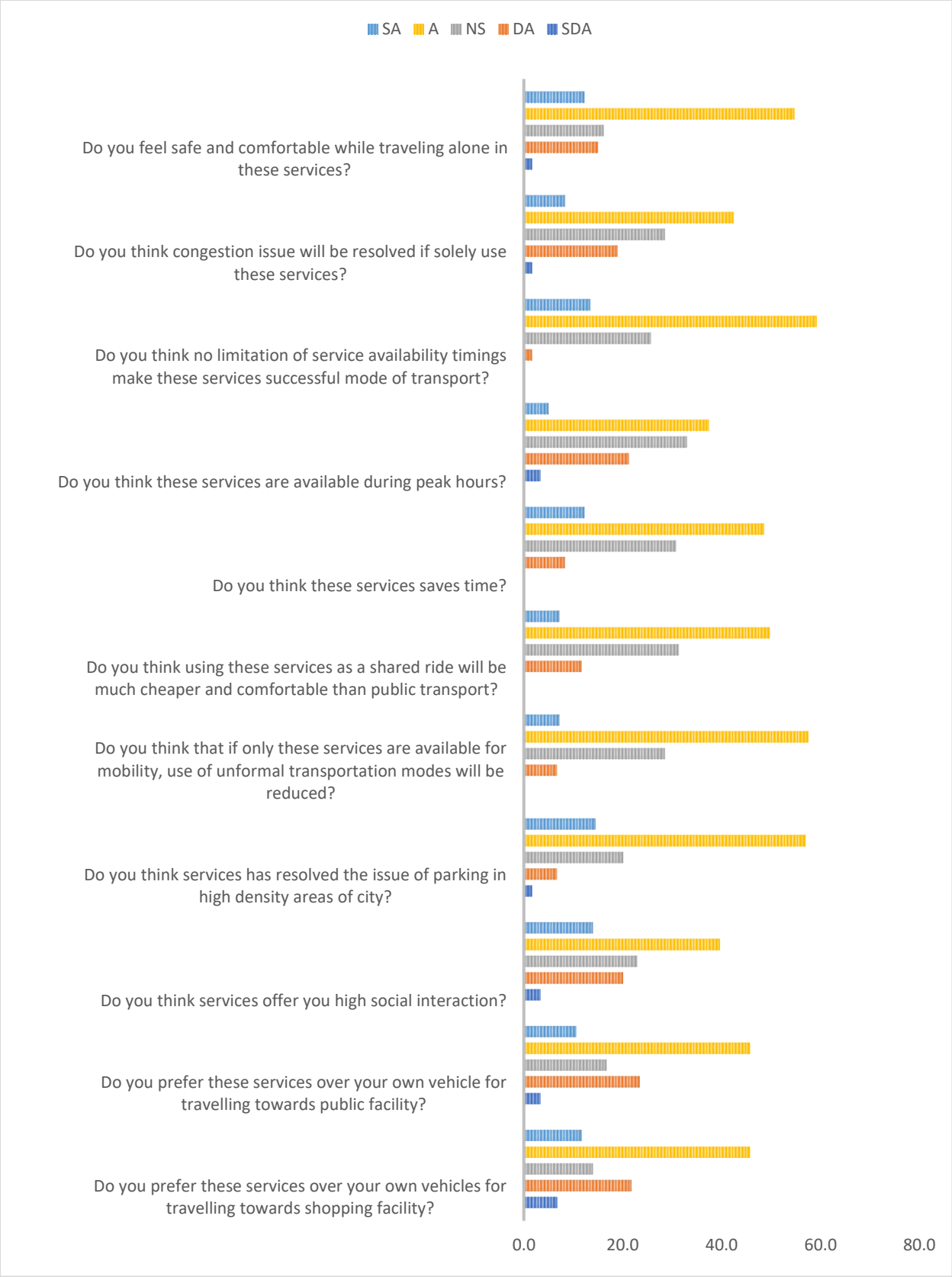

Figure 11. Frequency Analysis to Determine Public's Attitude.

Based on the frequency analysis of selected indicators related to user perception of rideshare catering services, most of the respondents have a positive perception of these services. The key findings from the analysis are:

i. "Do you prefer these services over your own vehicles for traveling towards shopping facility?", more than 45% of respondents agreed.
ii. "Do you prefer these services over your own vehicle for traveling towards public facility?", 45.8% of respondents agreed.
iii. "Do you think services offer you high social interaction?", 39.7% of respondents agreed.
iv. "Do you think services have resolved the issue of parking in high-density areas of the city?", 57% of respondents agreed.
v. "Do you think that if only these services are available for mobility, the use of informal transportation modes will be reduced?", 57.5% of respondents agreed.
vi. "Do you think using these services as a shared ride will be much cheaper and comfortable than public transport?", 49.7% of respondents agreed.
vii. "Do you think these services save time?", 48.6% of respondents agreed.
viii. "Do you think these services are available during peak hours?", 37.4% of respondents agreed.
ix. "Do you think no limitation of service availability timings makes these services a successful mode of transport?", 59.2% of respondents agreed.
x. "Do you think the congestion issue will be resolved if solely using these services?", 42.5% of respondents agreed.
xi. "Do you feel safe and comfortable while traveling alone in these services?", 54.7% of respondents agreed.

A large proportion of respondents agreed with positive views, such as preferring ride-sharing services over private cars, viewing private transportation services as a solution to parking and congestion problems, and calling them safe and convenient. A comfortable perception indicates that respondents have a generally positive perception.

Chapter -6- Conclusion & Recommendations

6 Conclusion and Recommendations:

After doing all the analysis, we came to the conclusion that the provision of ridesharing services in the selected regions was on average more flexible, with some users rating it as less flexible. Users are interested in this service for its availability and security. The data show that students represent an important user group for travel catering services and perceive the service to be moderate to flexible. This indicates that the service is well received by students and generally meets their expectations. The data also show that a user who uses the provisioning service her once a day, whether a student or an office worker, is more likely to rate the service as moderately stable. increase. It also demonstrates that the service meets customer expectations based on their daily mobility needs. Data reveals opportunities to improve service quality. While most respondents in this age group consider these services to be somewhat flexible, a significant proportion still consider travel booking services to be very flexible. General statistics show that travel sourcing services have the potential to grow and improve to meet the expectations and demands of this customer base.

We use this information to improve service delivery by introducing measures to improve transit reliability, resolve potential issues, and improve overall flexibility and user experience. . This will further improve customer satisfaction and loyalty across different revenue areas, leading to continued growth and success in the market.

Considering these findings, here are some additional suggestions for improving the resilience of ride sourcing services for all users:

6.1 Safety features & measures:

Implement and enable security features within your application or service. It includes features like sharing trip details with trusted contacts, real-time trip tracking, and comprehensive driver and vehicle background checks.

6.2 Driver training & awareness:

Improve driver training programs to address issues related to passenger safety and gender sensitivity. Drivers must be trained to respect boundaries, ensure a comfortable environment for all passengers, and respond appropriately to safety concerns.

6.3 Transparent feedback and reporting:

Establish a transparent mechanism for users, especially women to provide feedback and report incidents or concerns. Foster a culture of reporting and ensure that appropriate action is taken quickly to resolve reported issues.

6.4 Partner with safety organizations:

Partner with local safety organizations to focus on women's safety. This helps us provide additional resources and support to address specific user security concerns.

6.5 Education and awareness campaigns:

Conduct awareness campaigns to make users aware of the security features and measures of carpooling services. Provides knowledge on how to use the Services safely and what steps to take in the event of a security issue.

6.6 Dedicated support channels:

Establish a dedicated customer support channel dedicated to the needs of female users. Ensure support personnel are trained to address gender-specific issues and provide appropriate assistance.

6.7 Community engagement:

Promote community awareness and user participation by organizing events, workshops and forums for users to share their experiences and contribute to the improvement of services. It helps build user trust and loyalty.

By implementing these strategies, rideshare delivery services can become more resilient to their users, meet their unique needs, and maintain interest in their services. It is important to continually evaluate user feedback, monitor trends, and adapt our services to ensure they remain safe, accessible, and resilient for all users.

6.8 Limitations:

Linear regression model analysis revealed that the metrics used are limited and from the user's perspective, which may not be sufficient to understand the barriers to growth of ridesharing services. The data also reflects the user experience, but to better understand the resilience of ride-hailing services, we need to obtain data from the companies, organizations, drivers and teams that operate those ride-hailing services.

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