

A SWOT Analysis of E-Rickshaw Driving: The Biggest Informal Job Sector in Rajshahi City Corporation

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Abstract

Electric-rickshaws or e-rickshaws, also known as battery-driven auto-rickshaws, have changed the mode of the transportation system in metropolitan, urban and even peri-urban areas in Bangladesh. The major advantages of e-rickshaws, as transport, are that this sector employs many marginal city dwellers, unskilled rural migrant labour forces, is environmentally friendly, pollution-free, less fare and easy access on all roads and free from a fatal accident. This study has been done on e-rickshaws driving in Rajshahi City Corporation to investigate the strengths, weaknesses, opportunities and threats of this transport and informal job sector. The results show that e-rickshaws drivers' income is high compared to the last human pulled rickshaws, and at the same time, the income of personal e-rickshaws drivers (Tk. 26,668.83) is higher than rented e-rickshaws drivers (Tk.10279.41). Day by day, many people are involved in this informal job sector and drive e-rickshaws legally or illegally, which is

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not a good sign for long-term sustainable development as it creates traffic jam and chaos on the streets and creates pressure on electricity consumption. Along with banning illegal e-rickshaws, a new job sector should be created for the unskilled, semi-skilled and skilled workforce of the Rajshahi city, as well as more research is needed to supply power from solar energy to the e-rickshaws.

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Keywords E-rickshaws · Informal Job Sector · Employment · Environment · Development

1. Introduction

1.1 Overview of e-rickshaw driving

Electric-rickshaws (e-rickshaws/easy bikes, also known as battery-driven auto-rickshaws) have changed the mode of the transportation system in metropolitan, urban and even peri-urban areas in Bangladesh. In the last decade, human-pulled rickshaws were gradually replaced by e-rickshaws running on batteries through electricity. At present, e-rickshaws and two-seated battery-driven e-rickshaws are operating in different cities except for Dhaka North and South city corporations where human-pulled rickshaws are still running. Pulling rickshaws are more environmental-friendly but need much human effort, need a long time to reach their destination, and create traffic jams and the pullers earn less money than e-rickshaws.

E-rickshaws make the city life faster as people can move quickly from one place (short distance) to another place with cheap cost and comfort. The major advantages of e-rickshaws, as transport, are that these employ a large number of unskilled rural migrant labour forces, environmental-friendly, pollution-free, less fare and easy access on all roads and free from a fatal accident. This new mode of transportation facilitates passengers and helps to expand business and trade as the small traders carry their goods by the e-rickshaws. More important insights of introducing e-rickshaws are reducing pollution originating from petrol, diesel or CNG (compact natural gas) auto-rickshaws and dependency on pulled rickshaws which needed much human effort. Electric-rickshaw has been becoming in some cities in Bangladesh since 2008 which were imported from China. Nowadays, the Number of e-rickshaws and two-seated battery-driven e-rickshaws has increased since the local engineering workshops were able to manufacture them locally in Bangladesh.

According to the Country Report (2010), the informal job sector offered 88.5% of the total Number of jobs in the labor market, where rickshaw pulling was one of Bangladesh's largest informal job sectors. The data of the two Dhaka

city corporations has shown that 79,554 licensed human pulled rickshaws were running in the capital city Dhaka, where the actual Number estimated around 1.1 million (Shafiq, 2017). Another study has shown that around 7,00,000 to 8,00,000 rickshaws were operating in Dhaka city in 2012 and employed more than 1 million people, and with the help of these rickshaws, 7 million passenger trips were made in Dhaka city over a distance of 11 million passenger miles (Rahman, 2013). Like Dhaka city, other divisional and big city dwellers' were more or less dependent on rickshaws from the very beginning.

As a divisional city, Rajshahi is known as the city of rickshaws, and many poor people have been involved in this informal sector since long ago. At present, e-rickshaws (easy bikes) and two-seated battery-driven auto-rickshaws dominate Rajshahi city's streets and have become the main reason for city traffic jams (The Financial Express, 2018). According to Rajshahi City Corporation (RCC), 8,862 licenses were issued for e-rickshaws and 8,400 licenses for two-seated battery-driven auto-rickshaws, and at the same time, around 6,000 drivers of those vehicles were issued licenses from RCC authorities. RCC cancelled the registrations of two-seated battery-operated auto-rickshaws in September 2015, but now almost 40,000 legal and illegal e-rickshaws and two-seated battery-driven auto-rickshaws are playing in the city streets (The Financial Express, 2018). The serious allegation is that many e-rickshaws and two-seated battery-driven auto-rickshaws were running by showing fake licenses and by forging the duplicate Number with the help of dishonest employees of RCC, importers and sellers of those vehicles (The Financial Express, 2018). Rajshahi is an agriculture driven region, and most of the people are directly and indirectly involved in the agriculture sector. The financial and formal job sectors are limited here as the industrial sector does not expand like other cities. Small and medium enterprises absorb a small fraction of skilled and semi-skilled labour forces, and the remaining unskilled labour forces engage in informal sectors like rickshaw pulling/driving, construction worker, day labour, huckster. Rickshaw pulling/driving is the largest sector that soaks up poor and marginal people among these informal job sectors in Rajshahi city. Being popular, profitable, and low investment cost, a large number of people have changed their occupation and are involved in e-rickshaws and two-seated battery-driven auto-rickshaws driving. City dwellers and migrants from periphery and other districts come in Rajshahi city and drive e-rickshaws. This informal job sector has positive and negative effects on city dwellers, the energy sector and the environment. Many e-rickshaws create a traffic jam in the city's most essential points, create pressure on energy demand, and attracts marginal people from rural areas, which cause development

slam areas in Rajshahi city. Production, transportation, and distribution of batteries consume natural resources and emit exhaust and other pollutants into the atmosphere, contributing to an accelerating depletion of natural resources and greenhouse effects. At the same time, improper and careless handling of waste batteries and disposal of batteries in landfill sites can result in the release of corrosive liquids and dissolved metals that are toxic to plants, animals, groundwater and the environment (Merry, 2018).

Considering the present traffic jam in Rajshahi city, excessive consumption of electricity and the importance of e-rickshaws for city-dwellers and informal job market, this study tries to answer the following questions:

- 1) Are e-rickshaws or two-seated battery-driven auto-rickshaws driving the most significant informal job sector in Rajshahi city?
- 2) What are the strengths and opportunities of this informal sector?
- 3) What are the weaknesses and threats of this sector?

The popularity and Number of e-rickshaws in Rajshahi city have been increasing day by day due to less fare, less laborious and high speed, on the other hand, the Number of humans pulling rickshaws has been decreasing due to low speed, much laborious and low income (Basri et al., 2016). It is found that the average daily income of an e-rickshaw driver was Tk. 800 – Tk. 1000, where the human pulled rickshaw driver earned Tk. 300 –Tk. 400 or sometimes less than that. The previous rickshaw pullers changed their manual rickshaws to e-rickshaws, and at the same time, many poor and marginal people migrated to this job. The objectives of this paper are:

- i) To investigate the strengths and opportunities of e-rickshaw driving in Rajshahi city;
- ii) To identify the threats and weakness of this informal sector;
- iii) To develop some policy recommendations to overcome the threats and weaknesses of this sector.

A recent study depicted that battery-driven auto-rickshaws have reduced the unemployment problem by about 2%, increasing income, social status, and comfort (Rahim et al., 2013). It is found that the battery-driven auto-rickshaw has consumed about ten kilo-watt energy per charging and can travel at an average distance of 150 km per charging. Rana et al. (2013) investigated that this mode of transportation creates pressure on the local electricity supply and is responsible for 1.53 hours of load shading a day, which happens at off-peak periods, such as between 11.00 pm to 7.00 am. It is referred that e-rickshaw is economically beneficial as the cost-to-income ratio of this mode of transport was 100:185 and

currently the e-rickshaw drivers earn two to three times more money than their previous job (Rana et al. 2012). They also mentioned that 21% of the e-rickshaw drivers were previously unemployed and now engaged in this sector, and 38% of drivers decided to migrate to Dhaka if this mode of transport was not introduced in their city. Singh (2014) has surveyed socio-economic impacts and the technical characteristics of e-rickshaws in Delhi, India and found that this industry had a positive role in urban employment and income generation with some problems that affected the system. Mallik and Arefin (2018) emphasised redesigning the three wheeler auto rickshaw to make the key power source hybridised, which can take advantage of several sources of renewable energy, i.e. solar energy, wind energy. Solar energy and thermal energy can be used to drive the auto-rickshaw jointly using hybridisation, and in this case, solar energy is preferable as we get a massive amount of energy from the sun. Currently, the three-wheeler auto-rickshaws in Bangladesh are running on fuels (Compressed Natural Gas/Liquefied Petroleum Gas/petrol), non-renewable resources and the burning of petrol and natural gas and oils produce carbon dioxide that is responsible for global warming. Compared to other conventional vehicles, the researchers prefer micro hybridised vehicles consume less energy and produce much less greenhouse and toxic gases (Mallik and Arefin, 2018).

1.2 Significance of the study

The significance of this study is that very little research has been done on formal and informal job sectors in Rajshahi city. Rajshahi is known as a city of education, and every year, many students complete their higher study and migrate to Dhaka city to search for jobs. Since independence, the Rajshahi region has been deprived of the government's development allocation, and due to low investment and low public expenditure, the employment generation is feeble. In his election manifesto, the present city mayor declared that the employment generation would prioritise his development projects. The city mayor has plans to build an ICT (Information and Communication Technology) park and other industries in Rajshahi city, creating thousands of jobs for the people. Unfortunately, these projects do not progress, and the poor, unskilled and semi-skilled labour forces engage in e-rickshaw driving. This study investigates whether this informal job sector sustains for long-time or not and the barriers and threats involved in it.

1.3 Limitations of the study

At present, the total Number of auto-rickshaws is 15,000 (10,000 six seated and 5,000 two seated auto-rickshaws), where the Number of auto-drivers is 7,000

the beginning, SWOT analysis was first used to analyse businesses, but now it is often used by governments, non-profit organisations and individuals, including investors and entrepreneurs. Analysts present a SWOT analysis as a square with each of the four areas making up one quadrant which provides a quick overview of the company's position. The findings under a particular heading may not be of equal importance, but they all should represent critical insights into the balance of opportunities and threats, advantages and disadvantages and so forth (Shewan, 2019).

Table 2.1: Breaking down of SWOT analysis process

S Strengths	W Weaknesses	O Opportunities	T Threats
<ul style="list-style-type: none"> • Things the sector does well • Qualities that separate the sector from competitors 	<ul style="list-style-type: none"> • Things that the sector lacks • Things other sectors do better than this sector • Resource limitations 	<ul style="list-style-type: none"> • The emerging need for the product or service • Few competitors of the product or service • Excess or shortage of supply 	<ul style="list-style-type: none"> • Changing regulatory environment • Changing customer attitudes • Emerging competitions

Source: Shewan, (2019)

Generally, the four elements of all SWOT analyses are common, but many organisations compartmentalise these elements into two distinct subgroups: inter and external (Shewan, 2019). Strengths and weaknesses are considered internal factors resulting from organisational decisions under the control of an organisation or team. Similarly, emerging competitors would be categorised as a threat in a SWOT analysis, but since there is very little to do about this, this makes it an external factor.

Table 2.2: Internal and external analyses or matrices

	Opportunities (external, positive)	Threats (external, negative)
Strengths (internal, positive)	Strength-Opportunity strategies which of the company's strengths can be used to maximize the opportunities you identified?	Strength-Threats strategies How can you use the company's strengths to minimize the threats you identified?
Weaknesses (internal, negative)	Weakness-Opportunity strategies What action(s) can you take to minimize the company's weaknesses using the opportunities you identified?	Weakness-Threats strategies How can you minimize the company's weaknesses to avoid the threats you identified?

Source: Shewan, 2019

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Source: Shewan, 2019

This study mainly focuses on internal factors and little on external factors that may work as strengths, opportunities, weaknesses, or threats. It is easy to control the internal factors with collaboration with city corporations and administration.

3. Results and Discussion

Rajshahi region is in a backward position both socially and economically. Bangladesh government, as well as local politicians, gave little attention to the development of this region. The previous mayor, who supported the central government (2008-2013), took many development projects like construction of roads, drain, footpath, supply of gas at the household level, and beautification. From 2013 to 2018, no development activities were seen in this city due to political instability and inefficiency of the authority of the city corporation. During that period, the industrial sector didn't expand since there was no permission to supply gas at industrial sector and due to this, there is no mentionable/worth-mentioning achievement in the employment sector of Rajshahi city. The present city mayor will take massive development projects related to employment generation, but the progress is not satisfactory. The noticeable progress has been seen in the e-rickshaws/auto rickshaws driving sector, where the skilled and unskilled young generation is involved. Primarily, this informal job sector creates some employment opportunities, but this does not support long-term sustainable development.

3.1 Demographic features of the respondents surveyed

3.1.1 Age of the respondents surveyed

Age plays a vital role in boosting up a household's economy. It means that the Number of more young members in a household results in more labour force and hence more income. The results in the following table show the age groups and percentages statistics of the respondents. The Age of the respondents is classified into five age groups, i.e. 15-24, 25-34, 35-44, 45-54 and 55 – above. Most of the respondents (36.0%) are in the age group of 25-34 years. At the same time, 29.7% and 18.0% of respondents belong to the 35-44 and 45-54 groups, respectively. Therefore, it is clear that most of the respondents in the study area belong to the middle age group, which indicates that most of the respondents are directly involved in earning the group.

3.1.2 Level of Education

The level of education is an essential factor that positively impacts human behaviour and earning (Hasan, 1991). Education enhances the quality of the

Table 3.1: Age distribution of the respondents surveyed

Range of age	Frequency	Percentage
15-24	18	16.2
25-34	40	36.0
35-44	33	29.7
45-54	20	18.0
Total	111	100.0

Source: Field survey, 2019

respondents, which is helpful to diversify their income sources. In this study, the education level of the respondents is classified into six categories, i.e. class 1-5, class 6-9, S.S.C, H.S.C, bachelor, and masters. The findings show that among the educated respondents, 1.8 per cent of the households have education up to undergraduate level, followed by 34.2 per cent and 34.2 per cent are having S.S.C and H.S.C degrees, respectively. The rest of the households have completed either primary or secondary levels of education. It is alarming that highly educated people also involved in this low earning job sector.

Table 3.2: Education level of the respondents surveyed

Level of education	Frequency	Percentage
Class 1-5	11	9.9
Class 6-9	38	34.2
S.S.C	38	34.2
H.S.C	20	18.0
Bachelor's	2	1.8
Masters	2	1.8
Total	111	100.0

Source: Field survey, 2019

3.1.3 Number of family members of the respondents surveyed

Table 3.3 indicates the distribution of family members of the auto drivers. The average family size is 4.95 of the respondents surveyed in Rajshahi city, which is slightly higher than the national average of 4.44 in 2011 (The Independent, 2017), where 37.8 % respondents have 5 members 27.0% have 4 members in their families. The results have shown that still there are some joint families (5.4%) where family members exist between 8 and 14. Around 90.0% of respondents have a small family where family members vary between 3-6.

Table 3.3: Distribution of family members of the respondent's family surveyed

Number of a family member	Frequency	Percentages
3.00	15	13.5
4.00	30	27.0
5.00	42	37.8
6.00	15	13.5
7.00	3	2.7
8.00	2	1.8
9.00	1	.9
11.00	1	.9
14.00	2	1.8
Total	111	100.0
Average family member	4.95	

Source: Field survey, 2019

3.1.4 Number of school-going children of the respondent's family

The number of school-going children is very important to analyse the socio-economic conditions as the auto drivers have to bear the expense of children's education with low and limited income. Though female child gets some benefits from the government but not sufficient, sometimes the auto drivers cannot provide adequate educational facilities.

Table 3.4: Number of school-going children of the respondent surveyed

Number of school-going children	Frequency	Percentage
No school going children	8	7.2
1.00	35	31.5
2.00	57	51.4
3.00	10	9.0
4.00	1	.9
Total	111	100.0

Source: Field survey, 2019

3.1.4 Earning members of the respondent's family surveyed

The number of earning members is an important factor for the solvency of a household. Per-capita earning is very low which is not sufficient to maintain family expenditure. The households which have more than one earning members get some financial freedom. This study found that 64.0% households have one earning member and 31.5% have two earning members. Very few households (around 5.0%) have 3 to 5 earning members, indicating that these families live jointly. The members of the poor and marginal families involve in low-income

jobs and works. In most cases, the e-rickshaws drivers' wives also involve informal job sectors to support family expenditure.

Table 3.5: Number of earning members of the respondent's family surveyed

Number of earning member	Frequency	Percentage
1.00	71	64.0
2.00	35	31.5
3.00	2	1.8
4.00	2	1.8
5.00	1	.9
Total	111	100.0
Average Number of earning member		1.44

Source: Field survey, 2019

3.2 Socio-economic features of e-rickshaw drivers

3.2.1 Main and previous occupation of the respondents surveyed

The households in the study area are involved in a variety of activities for earning their livelihood. In terms of occupation, they are grouped as auto driving, business and others. The respondents, along with auto driving, adopted some other occupations to supplement their income. It is found from Table 3.6 that 84.7% of respondents take auto driving as their primary occupation, whereas only 4.5 % of respondents do business as their primary earning source. It indicates that a significant portion of the respondents drives auto-rickshaws all day long. Around 12% of respondents were involved in other job sectors to earn and drive auto-rickshaws as their supplementary job.

Auto-rickshaw has introduced in Rajshahi city approximately one decade ago and getting popularity day by day. Table 8 has shown that 34.2 % auto drivers were involved in business but now driving e-rickshaws and 50.5% came from other jobs like construction work, day labour. Most of the respondents left their previous job and started auto driving as it is comfortable and income is also high.

Table 3.6: Main and previous occupation of the respondents surveyed

Category	Main Occupation		Previous Occupation		
	Frequency	Percentage	Category	Frequency	Percentage
Auto Driving	94	84.7	Service	8	7.2
Business	5	4.5	Business	38	34.2
Others	12	10.8	Farming	9	8.1
Total	111	100.0	Others	56	50.5
			Total	111	100.0

Source: Author's own calculation, 2019

3.2.3 Ownership of the auto-rickshaws of the respondents surveyed

The financial condition of the respondents of Rajshahi city is not well as there are no sufficient job opportunities and earning sources. It is difficult for them to manage Tk. 75,000-1,75,000 at a time to buy e-rickshaws or two seated battery driven auto rickshaws. Table 3.7 shows that 69.4 per cent of respondents have personal auto-rickshaws, whereas 30.6% drive rented auto-rickshaws. Though 70.0% of respondents have personal e-rickshaws, most of them have a loan in different organisations.

Table 3.7: Ownership of the auto-rickshaws

Type of ownership	Frequency	Percentage
Personal	77	69.4
Rental	34	30.6
Total	111	100

Source: Author's own calculation, 2019

3.2.4 Producer of e-rickshaws answered by respondents

In the beginning, 100% of auto-rickshaws were imported from China, but now the scenario has changed. Now the local producers and technicians are efficient enough to manufacture auto-rickshaws locally. Due to local production, the price of the auto-rickshaws has been reduced and save foreign currency which was spent on buying them from abroad.

Table 3.8: Producer of e-rickshaws answered by respondents

Name of country	Frequency	Percentage
Bangladesh	96	86.5
China	13.5	13.5
Total	111	100

Source: Authors' calculation, 2019

3.2.5 Price of auto-rickshaws and income of auto drivers

The price of e-rickshaw (6 seated) and battery-driven two seated auto-rickshaw is not the same. Two seated battery-driven auto-rickshaw is manufactured locally, and the price varies between Tk. 70,000 to Tk. 1,00,000, where the price of six seated auto-rickshaw varies between Tk. 1,20,000 to Tk. 1,75,000. This study found that the respondents paid an average Tk. 123,116.90 for purchasing their e-rickshaw, where the minimum cost was Tk. 65,000.00, and the maximum cost was Tk. 175,000.00. The price of e-rickshaw is very high for poor and marginal

drivers as this study found that 62.20% of auto drivers took credit for purchasing the e-rickshaw and the average loan amount was Tk. 74,637.68.

The average family income of the respondents was Tk. 21,418.92, and the minimum and maximum income were Tk. 17,000.00 and Tk. 50,000.00 respectively. The average earning members of the respondent's family were 1.44, where 62.20% family has one earning member, and 37.80% family has two earning members. Therefore, the e-rickshaw drivers were the principal earning members of the family. This study found a clear difference between the income of e-rickshaw drivers who have personal e-rickshaw and those who operate rented e-rickshaw. The average monthly income of e-rickshaws drivers who have personal e-rickshaws was 26,668.83, but the average monthly income of e-rickshaws drivers who have rented e-rickshaws was Tk 10,279.41 excluding the rent (Tk. 13,773.52), they have to pay the owners. More than fifty per cent of income goes to the owner who operates rented e-rickshaws.

Table 3.9: Price of e-rickshaws and income of auto drivers

Income and expenditure (in Tk.)	Average	Minimum	Maximum	Frequency
Price of auto-rickshaw	123,116.90	65,000.00	175,000.00	77
Monthly family income	21,418.92	17,000.00	50,000.00	111
Monthly income from auto driving (personal auto-rickshaw)	26,668.83	15,000.00	27,000.00	77
Monthly income from auto driving (rented auto-rickshaw)	10,279.41	7,500.00	18,000.00	34
Monthly rent paid to the owner of auto-rickshaw	13,773.52	10,500.00	16,500.00	34

Source: Authors' calculation, 2019

4.2.6 Net income of e-rickshaws drivers

Table 3.10 indicates that the average total monthly income of the e-rickshaws drivers was Tk. 21,732.43, where the maximum income was Tk. 33,000.00, and the minimum income was Tk. 15,000.00. The e-rickshaws drivers have some monthly expenditures like rent of e-rickshaws, cost of battery charging, rent of garage, repairing cost and other costs. The e-rickshaws drivers who operated rented auto spent a large portion of income for rent (monthly average Tk. 13,772.52). The average monthly battery charging cost was Tk. 4,550.64, and the average repairing cost was Tk. 875.51. The e-rickshaws drivers who drive rented

e-rickshaws no need to pay the charging cost and rent of the garage. The average monthly cost of maintaining an e-rickshaw was Tk. 8,408.46, and sometimes this cost reached Tk. 16,900.00. Finally, excluding all maintaining costs, the e-rickshaws drivers earned Tk. 13,323.96 every month, which is very low for maintaining their daily livelihood.

Table 3.10: Net income of e-rickshaws drivers

Income and expenditure	Average (monthly)	Minimum (monthly)	Maximum (monthly)	Frequency
Monthly income from e-rickshaw	21,732.43	15,000.00	33,000.00	111
Maintaining cost of e-rickshaw				
Rent paid to the owner of auto-rickshaw	13,773.52	10,500.00	16,500.00	34
Battery charging cost	4,550.64	1200	6,500.00	77
Repairing cost	875.51	100.00	1,500.00	78
Rent of garage	598.03	300.00	900.00	56
Other expenses	297.36	100.00	1,500.00	38
Monthly cost of maintaining e-rickshaw	8408.46	1,920.00	16,900.00	111
Monthly Net income from e-rickshaw	13,323.96	7,100.00	21,000.00	111

Source: Authors' calculation, 2019

3.2.7 Possibility of accident of the e-rickshaws

Due to low speed and running in the city area, the possibility of an accident is very low of the e-rickshaws. The study found that 12.6% of respondents mentioned a high chance of an accident of e-rickshaw, whereas 87.4% of respondents indicated a low chance of an accident. When the e-rickshaws are running on the highway, the possibility of an accident is very high. No training or driving test is required for running e-rickshaws, and sometimes unskilled rural people come in city area and drive e-rickshaws, who have not enough idea about the traffic rules in the city area that may cause an accident.

Table 3.11: Possibility of accident of the e-rickshaws

Possibility of accident	Frequency	Percent
High	14	12.6
Low	97	87.4
Total	111	100

Source: Authors' calculation, 2019

3.3 Analysis of Strengths, weaknesses, opportunities and threats of e-rickshaw driving (SWOT Analysis)

3.3.1 Strengths

As an informal job, e-rickshaw driving has significant contributions to social and economic life that respondents identify. Today, Rajshahi not only offers cleaner air and an essentially dust-free environment for its residents but has also received worldwide recognition for achieving the most considerable reduction in levels of harmful PM10 (particulate matter 10 micrometres or less in diameter) between 2014 and 2016. It sets an inspiring precedent for other major cities, particularly Dhaka, in successfully tackling air pollution (Khan, 2017). The e-rickshaws have contributed to keeping the air clean as these vehicles do not produce CO₂ directly and take the place of CHG auto-rickshaws and diesel-operated light vehicles in Rajshahi city. The results indicated that 97.3% of e-rickshaw drivers believed that these vehicles are environmentally friendly, and 91.8% of respondents believed that e-rickshaw Rajshahi city releases less CO₂ into the air. The people involved in e-rickshaw driving (83.3% respondents) earn more money than their previous job and even earn more money than peddlers who drive human-pulled rickshaws. It is found from Table 3.12 that 67.6% of respondents answered that their daily income is sufficient to maintain family expenses, whereas 32.4% of respondents face difficulties to bear family expenses with this small earning. The survey results have shown that 99.1% of e-rickshaws drivers agreed that e-rickshaw creates directly and indirectly tremendous work opportunities (e-rickshaw drivers, repairing and parts shops, garage business, import business, manufacturing industry) for this city dwellers and for the migrant people, where 90.1% agreed that e-rickshaw driving sector alone offers enormous job opportunities for the people. The most vital features of these vehicles are that they are suitable for travelling short distances (95.5%) and safe and comfortable (80.2%) in the city area. The poor and marginal people who have pulled rickshaws got relief from human and laborious occupation due to introducing e-rickshaws. The temperature in Rajshahi city is scorching in the summertime, and it was difficult for both pullers and passengers to travel by human pulled rickshaws which were very slow and laborious. However, e-rickshaws also provide transport services cheaply, especially the six seated e-rickshaws, which are affordable for all categories of people.

3.3.2 Opportunities

The e-rickshaw driving sector creates new job opportunities for the city dwellers, and more than fifty per cent (60.4%) respondents liked to take it as a long term

Table 3.12: Strengths of the e-rickshaw driving (the biggest informal job sector in Rajshahi city)

Strengths	Yes	No
Is e-rickshaw environmental friendly?	97.3	2.7
Do you believe that due to e-rickshaw, Rajshahi city releases less CO ₂ into the air?	91.8	8.2
Is your daily income from e-rickshaw driving enough to cover family expenses?	67.6	32.4
Do you believe that e-rickshaw creates employment in Rajshahi city?	99.1	.9
Do you believe that e-rickshaw driving is the biggest new informal job source in Rajshahi city?	90.1	9.9
Is it good for travelling a short distance?	95.5	4.5
Does e-rickshaw provide transport service at a cheap cost?	99.1	.9
Is e-rickshaw driving well than the previous occupation?	92.8	7.2
Do you earn more money than in your previous job?	83.8	16.2
Do you need less effort to run an e-rickshaw than peddle a rickshaw?	91.9	8.1
Is this mode of transport safe and comfortable?	80.2	19.8

Source: Field Survey, 2019

occupation. The remaining 39.6% of respondents did not like to take it as a long-term occupation due to high rental costs, license fees, and excess e-rickshaws in Rajshahi city. The Rajshahi city area and population increasing day by day, and the demand for e-rickshaws also increase along with population, which implies that this informal job sector provides a good number of long-term job opportunities for the city dwellers. E-rickshaws dominate Rajshahi city, and very few diesel and NG operated vehicles are running through the town. The city dwellers feel comfort by travelling with e-rickshaw as it is pollution-free and people can travel in any distance and narrow roads. Table 3.13 has shown that 46.80% of respondents believe that e-rickshaws is one of the main reasons not to introduce diesel or CNG operated vehicles in Rajshahi city. Local engineers and manufacturers always working to improve the quality of e-rickshaws, and there is a chance to operate the e-rickshaws with solar energy, as indicated by 34.23% of respondents. The economic and social activities in Rajshahi city increase very rapidly. Small and medium traders use e-rickshaws at cheap cost and travel easily in all locations, which speed up the city trade and economic and social development.

3.3.3 Weaknesses

Though this mode of transport and informal job sector has several advantages and some weaknesses, according to the official report of Rajshahi city corporation,

Table 3.13: Opportunities of the e-rickshaw driving (the biggest informal job sector in Rajshahi city)

Opportunities	Yes	No
Do you like to take e-rickshaw driving as a long term occupation?	60.4	39.6
Do you believe that more advanced e-rickshaw will take the place of diesel or gas operated vehicles soon?	46.80	53.20
Do you believe that shortly, e-rickshaw can operate with solar energy?	34.23	65.77
Do you believe that e-rickshaw contributes to economic development?	97.3	2.70

Source: Field Survey, 2019

around 15,000 e-rickshaws (six seated and two seated) are running with legal licenses. However, unofficial reports have shown that around 40,000 e-rickshaws are operating all over the city (The Financial Express, 2019). It indicates that around 25,000 e-rickshaws are running illegally, which creates traffic jams, increases malpractices, and reduces legal license owners' income. However, 96.4% of respondents answered that they have legal licenses, but it is difficult to ensure that they are legal or illegal. The charging of the batteries of e-rickshaws creates pressure on electricity all over the country along with Rajshahi city. In the summer season, load shading in Rajshahi city increases due to battery-driven e-rickshaws. When there were 7,000 auto-rickshaws in Rajshahi city in 2013, battery-driven auto-rickshaws consumed 81.2 MWh per day, i.e. 10.15MW, and the average load at Rajshahi city in Bangladesh was 235 MW. The average load due to battery-driven auto-rickshaws at Rajshahi city was 10.1 MW, 4.32% of the total load at Rajshahi city in Bangladesh (Rahim et al. 2013). Now 40,000 e-rickshaws are running at Rajshahi city, which is responsible for more load shading than a previous time. Another weakness of this sector is that with the help of dishonest officials of Rajshahi City Corporation, a large Number of illegal e-rickshaws is running the city, which is more than demand and necessity. Around 82.9% of respondents agreed that this surplus e-rickshaws create traffic jams and reduce legal e-rickshaws drivers' income. This study has shown that some educated people also drive e-rickshaws since they have no alternative job opportunities, and they (21.6%) believe that this occupation decreases their social status. Table 3.14 has expressed that 62.20% of e-rickshaw owners took credit to buy these vehicles indicate that the price of e-rickshaw is high and beyond the capacity of the poor and marginal people. This mode of transport creates pressure on electricity and indirectly pollutes the air (where electricity is produced by oil, gas or coal in Bangladesh), which is the major weakness of this vehicle. Almost 98.2% of respondents depend on electricity produced by oil or gas or coal, and only 1.8% use another energy source. Finally, though these vehicles are suitable

for straight and narrow roads, they are not suitable for hilly roads and bad weather due to their low power capacity.

Table 3.14: Weaknesses of the e-rickshaw driving (the biggest informal job sector in Rajshahi city)

Weaknesses	Yes	No
Do you have a legal license?	96.4	3.6
Does e-rickshaw create pressure on electricity demand?	73.9	26.1
Is the Number of e-rickshaw higher than necessary Rajshahi in the city?	82.9	17.1
Do you believe that e-rickshaw driving increases your social status?	21.6	78.4
Have you taken any loan to buy-rickshaw?	62.2	37.8
Do you use any other charging system (solar energy) except electricity?	1.8	98.2

Source: Field Survey, 2019

3.3.4 Threats of the e-rickshaw driving (the biggest informal job sector in Rajshahi city)

This new mode of transport has some threats to social and environmental sectors. A large number of battery-driven auto-rickshaws have increased the demand for electricity, and to meet up the excess demand of electricity, the government needs to produce more electricity by burning fuel, gas and coal as very little electricity produces from fresh sources like this solar power and hydro. Therefore, these vehicles are the threats (answered by 48.6% of respondents) for the environment as they produce CO₂ indirectly. The wasted batteries are also harmful to air, water and land as the wasted batteries release lead (Pb). Nowadays, the people of Rajshahi city face colossal traffic jams in some critical points every day, as indicated by 75.7% of respondents (Table 3.15). Day by day, the illegal and excess e-rickshaws will treat city dwellers since these vehicles create chaos on the roads and essential points. As a light vehicle, e-rickshaws are not permitted to run on the highway and outside the city area, but sometimes the e-rickshaw drivers break the laws and drive on the highway. These light and small vehicles reduce the speed of large vehicles and also causes fatal road accidents. The traffic police and highway police are sometimes unable to control them from running on the highway.

More importantly, due to low income, poor financial conditions, and the absence of a large industrial sector, very few private vehicles are seen on the streets in Rajshahi city. Therefore, maximum people depend on e-rickshaws for their daily travelling, and at the same time, some people accept this opportunity as their better-earning source. However, the threat is that if the other job sectors

Table 3.15: Threats of the e-rickshaw driving (the biggest informal job sector in Rajshahi city)

Threats	Yes	No
Does wasted battery threaten the environment?	48.6	51.4
Do you believe that e-rickshaw is the main reason for the traffic jam in Rajshahi city?	75.7	24.3
Do you believe that e-rickshaw is the main reason for road accidents as a light vehicle on the highway?	53.15	46.85
Do you believe that charging a large Number of e-rickshaws causes excessive load shading in Rajshahi city?	94.59	5.41

Source: Field Survey, 2019

are not expanded, more and more people engage in this informal and low earning sector, create chaos on streets, increase malpractices among different sectors, which ultimately hampered the long-term development of this city.

4. Policy recommendation and conclusion

4.1 Policy recommendation

The above discussion proves that e-rickshaws have made the city transport and communication system easy, less costly, fast, safe and comfortable. The city dwellers cannot think about their daily life without e-rickshaws. This study forwards some policy recommendations to get better service, make city life more comfortable, and sustainably develop Rajshahi city and the whole country.

- To reduce traffic jams in Rajshahi city, Rajshahi city corporation authority should take proper steps to ban illegal e-rickshaws from the city streets and bring all the office staff involved in issuing illegal licenses and doing so malpractices.
- More research and financial support are needed to invent more advanced technology to use solar energy in the e-rickshaws and reduce pressure on electricity consumption and load shading. Government can work with engineering universities and Polytechnique institutes for technological up-gradation.
- The authority of Rajshahi City Corporation should issue a legal license and arrange training and driving tests before issuing the license so that the drivers have a clear idea about traffic rules and regulations.
- There is no space to satisfy this informal job sector. The income from this job sector is not enough to maintain the social and living standard. This employment opportunity is not enough for sustainable and long term

development. This informal sector just absorbs unskilled and poor marginal people with some educated people. There are not enough job opportunities for the skilled and semi-skilled labour force. For developing the Rajshahi region, government and local administration should emphasise developing the industrial sector and IT-based service sector. Local resources based industries (mango, litchi, jute, sugarcane and potato) should establish in the Rajshahi region.

- To reduce fatal accidents on the highway, e-rickshaws should be entirely banned, and financial punishment should be implied if someone breaks the laws.
- The auto stand should clearly indicate where they can pick up and drop passengers in the city area to avoid unnecessary traffic jams and chaos.
- The e-rickshaws drivers who drive rented e-rickshaws earned low income compared to personal e-rickshaws drivers. The rent the drivers paid to the owners of the e-rickshaws is logical as the drivers no need to pay battery charging cost, rent of garage, repairing cost and cost of batteries. The e-rickshaw drivers claimed that the rent is low compared to the distance travel by the passengers. They suggest increasing rent around 40-50% from the existing rent.
- Around 62.20% of e-rickshaws drivers took credit from different non-government organisations to buy e-rickshaws, and they have to pay high interest. Government should provide credit with low or no interest through development bank or Karmoshongsthan Bank

4.2 Conclusion

Transport is essential for city dwellers where cheap and comfortable transport makes city life more manageable. We could not ignore the contribution of e-rickshaws in our daily life as many people use them for means of transport and others use means of earning. Now the city streets accommodate two times more e-rickshaws where around 25,000 are illegal. Along with banning illegal e-rickshaws, a new job sector should be created for the unskilled, semi-skilled and skilled workforce for the people of the Rajshahi city. Day by day, many people are involved in this informal sector and take it as their new earning source, which is not a good sign for sustainable development.

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