The Assessment of Motor Vehicle Repair and Maintenance Activities in Different Level Garages in East Gojjam Zone, Ethiopia

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Abstract: *Maintenance had been defined as an activity applicable to all systems, natural and artificial, to cause such systems to remain unaltered or unimpaired. It is the repair activity carried out on vehicles or other machineries to keep them unaltered, and if altered, to restore them to their original state. This work assesses all vehicle repair and maintenance activities in different level garages in East Gojam zone. The data collection methods were focused on the three main things such as: observation, interview and questionnaires. The study publicized that the auto-mechanics as well as garage proprietors despite their vast experience in automotive repair activities, most of the auto-mechanics or garage proprietors in this zone find it challenging to identify the problem and repair modern trends of different vehicles, specifically modern electronic engines. During an interview of modern vehicle proprietors and offered an eye witness on the selected garages, most auto-mechanics incompetence to repair and maintain modern vehicles due to their low levels of education. Most of the garage proprietors as well as the mechanics can't understand the service manual and even they couldn't interpret drawings due to the language problem in addition to their education level. To address the necessary repair and maintenance activities on the defected parts of the vehicle, basic adequate tools will be there on the garage, but from the data obtained through questionnaire and direct observation, most garages haven't equipped with basic tools. Due to their low level of education and unavailability of adequate tools, most of the auto-mechanics used a trial and error problem solving method instead of using modern diagnostic or scanning tools. Therefore; to minimize the above problems, well organized training institutions in different perspective will be administered for the existing auto-mechanics as well as garage proprietors. For the newly generated auto-mechanics as well as garage proprietors, the education system in the country level must be revised depend on the current technology implemented on the automotive industry. The governmental organizations must assist these garages to cop up with educated auto-mechanics, modern equipment's, specifically the electronic vehicle diagnostic equipment's and adequate basic tools.*

***Index Terms*:** Auto-Mechanics, Experience, Garages, Maintenance, Proprietors, Repair, Vehicle,

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1. INTRODUCTION AND RELATED REVIEW LITERATURES

Transportation is one of the rudimentary desires for the appropriate functioning of societies as its petition is extremely related to the movement of people from one place to another. Road transport

is the adjoining to people out of all other transportation systems. The main advantage related from the others, its flexibility, which allows it to operate from door-to-door over short distance at the most inexpensive charges. In Africa over 80% of goods and peoples are transported by roads using vehicles where as in Ethiopia the transport using roads accounts for over 90%. Thus, transportation has a direct effect on the regular activities of the people and to precede these activities in a good manner, vehicle maintenance must be organized in different levels. This clearly implies that there is a need for a corresponding expansion of infrastructures and services as like as automotive maintenance [1]. One country's economy and trade thoroughly attached with the automotive sector due it shapes the industry, the cities, public and individual life [2].

This automotive sector be healthy and assists ones country economy, well organized maintenance in different level will be created. Maintenance had been defined as an activity applicable to all systems, natural and artificial, to cause such systems to remain unaltered or unimpaired. It is the repair activity carried out on vehicles or other machineries to keep them unaltered, and if altered, to restore them to their original state [3]. According to [4] digitization will drive more innovation in the automotive sector in the next few years than there has been in the previous many years. The advanced reassembly of client and company resources, products and services, which is used to grow value, income and productivity through digital technologies, is the result of digital transformation of the automotive sector.

The automobile sector [5] in modern times has perceived much technological improvement. The most significant and to be built into cars has to be the Engine Management System and transmission control module. These management systems are the brain of the car that controls the fuel supply, emission level, knock and ignition by combining the different functions into one main system.

The ECU controls the entire of the ignition process that makes the engine more efficient and less polluting than a vehicle which has not any engine management system early. These advanced technologies work on a set of enthusiastic sensors and ECUs, which are programmed to control the functioning and operation of these technologies. If any faults in ECUs and other systems are recorded, diagnostic scan tools, can diagnosis and reflect the faults in such systems have been eased as well as the time taken to perform the same task is reduced to a great extent [6].

When the technology on the vehicle and its maintenance are advancing, a lot of problems facing on automobile technicians that directly affect the transportation system meanwhile affecting all the other systems. Some of the consequences of the auto technician problems contain: unpredictable breakdown of vehicles on the highways, failure of vehicle parts such as steering's; ensuing an accidents and hurt of

lives, delay and failure of important appointments, and so on. A system with an optimum performance can be generated if all problems identified are tackled. This will go a long way in improving the problems being encountered by the auto technicians in our society [7].

Whereas to secure the above problems that happened due to the auto technician faults, ECUs has a self-test capability that regularly examines the signs from engine sensors and in some illustrations the actuators also examines to take a remedy. When a fault being present the ECU internally logs a code and this code can be extracted from an output terminal that represented as a diagnostic plug scan tool [8].

Currently, the quantity of electrical and electronic equipment has increased significantly, and this trend is likely to continue into the next decade. If the person undertaking a repair and does not understand the basic mechanical as well as electrical or electromechanical systems, it would be well-known that severe problems are expected on modern vehicles. This is particularly important in the field of diagnosis, because ignorance in either one of these areas of knowledge can lead to component damage and costly repairs. Whereas in the past, most repair activities on a motor vehicle could be divided into either mechanical or electrical tasks, nowadays the systems are fully integrated [9]. According to the study of [10] the local car repair and maintenance garages in Ethiopia thoroughly in East Gojjam can be classified as micro, small medium and large scale garages. The classification are depend on staff strength, working area, infrastructure, working materials (tools), education level, type of maintenance depend on the car model and size.

Moreover, in [11] the car which has a brain box and other electronic gadgets that sense instant faults in the vehicle and immediately notifies the driver through the dashboard display. The modern trend of mechanical services therefore requires the use of more complex and highly technological specialty diagnostic equipment to analyze vehicle faults for repair and service. To ensure this for efficiency, safety, comfort, style and so on, competent professional hands are required.

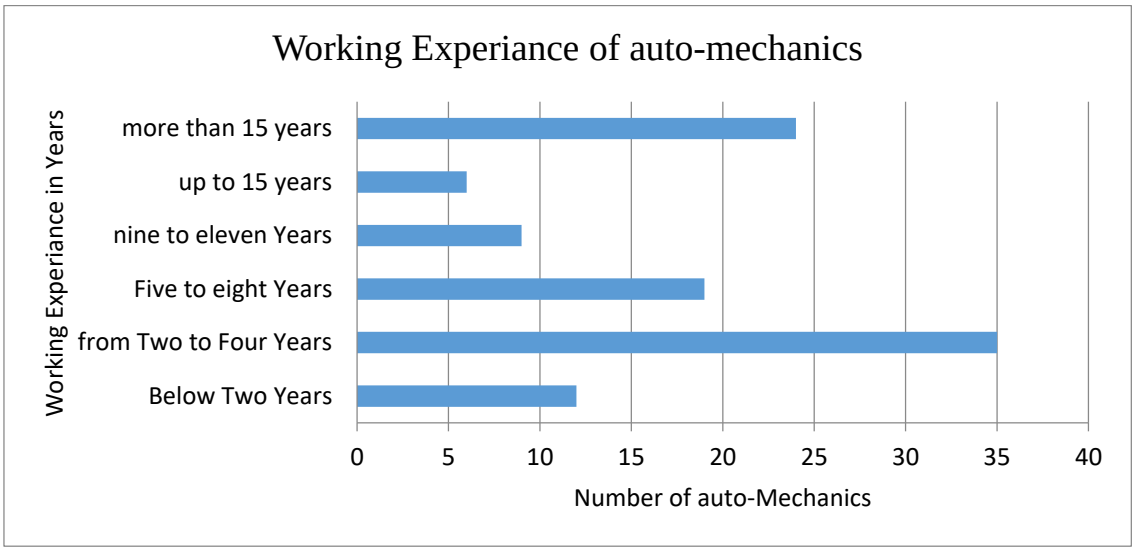
2. Methodology

The data collection methods were focused on the three main things such as: observation, interview and questionnaires. The questionnaires were managed to the auto mechanics and vehicle proprietors in the nominated automobile vehicle repair garages in Debre Markos city and near woreda cities , East Gojam zone; Ethiopia. In this stage of the data collection an open and close-ended questionnaires to 105 automobile mechanics and 49 garage proprietors were administered using random sampling method. During the organization of the questionnaires, Auto mechanics and garage proprietors, who might not read and write in English, the questions interpreted for them in their local languages. The data collection was cramped to

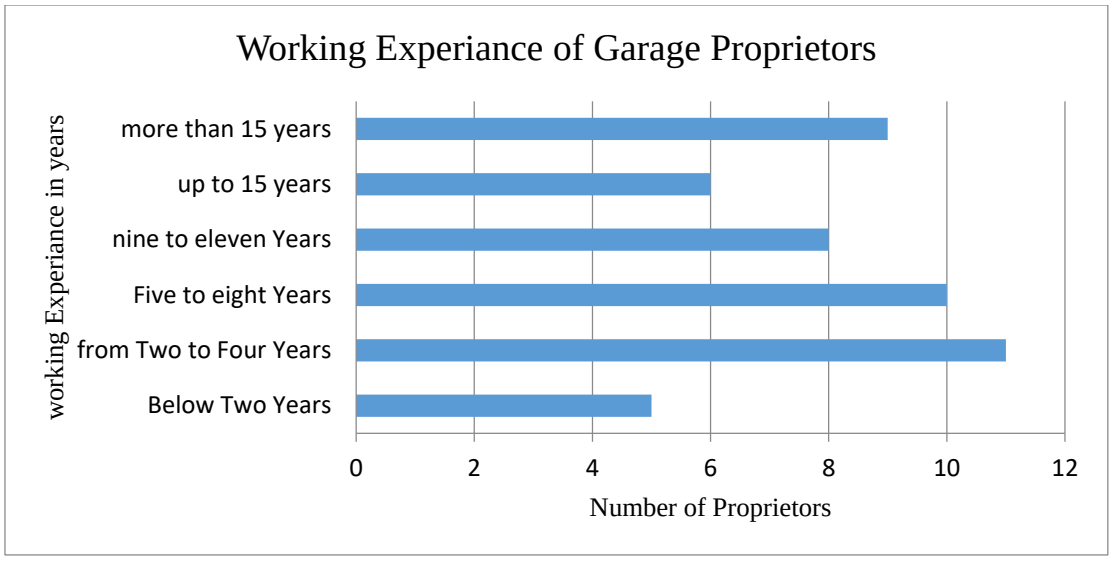
these places because the cities (Debremarkos and near woreda cities) are alarmingly developing in deferent perspective and even the number of cars becomes high but the newly coming modern cars went to other cities for repair and maintenance. The other data gathering method was an interview with vehicle and garage proprietors in the cities. One hundred twenty (120) modern vehicle proprietors in the bus stations were intentionally selected and interviewed. In general, forty-nine micro, small and medium level garages at East Gojam zone; Ethiopia was visited. At the end apart from questionnaires and interview, field observations and discussions were also used to some extent in collecting the important data.

3. RESULTS AND DISCUSSIONS

From the working experience, shown in figure 1, (a), of automotive mechanics in a years in the particular vehicle garages at East Gojam; Ethiopia, out of the all response rate, about 23% have had above 15 years working experience, 6% had between 12-15 years working experience, 9% had between 9-11 years working experience, 18% had between 5-8 years working experience, 33% had between 2-4 years working experience, while the rest 11% had below 2 years car maintenance working experience. On the other hand, the working experience of garage proprietors in a selected vehicle garages, figure 1, (b), from the given response rate, about 18% have had above 15 years working experience, 12% had between 12-15 years working experience, 16% had between 9-11 years working experience, 21% had between 5-8 years working experience, 23% had between 2-4 years working experience, while the rest 10% had below 2 years car maintenance working experience.



a)

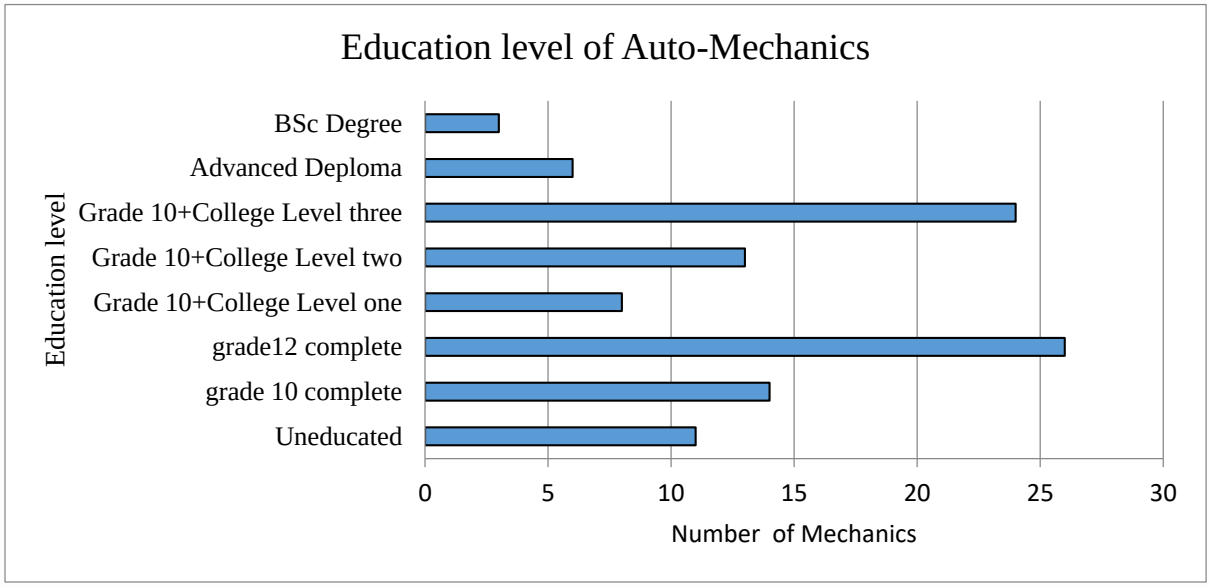


b)

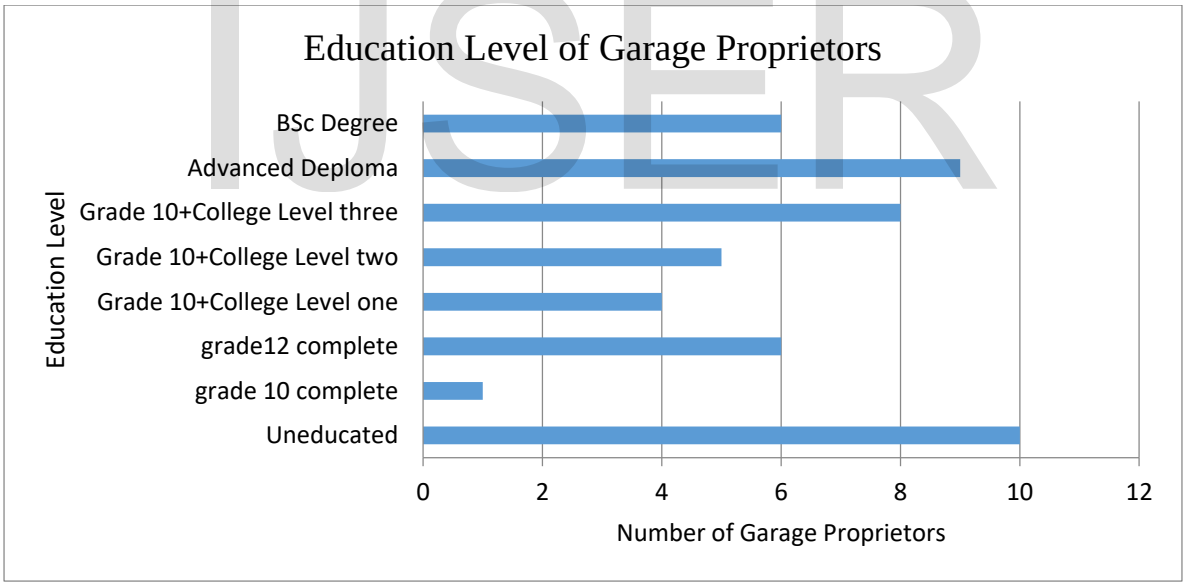
Figure 1 Working Experience of a) Auto-Mechanics, b) Garage Proprietors

Additionally, the levels of education, depend on the Ethiopian education system, as shown in figure 2, (a), by the auto mechanics in the selected vehicle garages includes: 10% have had uneducated, 13% were Grade 10 complete, 25% had grade 12 national leaving certificate, 8% grade 10+college diploma in level one, 12% grade 10+college diploma in level two, 23% grade 10+college diploma in level three, 6% in advanced diploma whereas 3% had a bachelor of science in mechanical engineering. In other words, the levels of education as indicated by the garage proprietors in figure 2, (b), on the selected vehicle garages includes: 21% have had uneducated, 2% were Grade 10 complete, 12% had grade 12 national leaving certificate, 8% grade 10+college diploma in level one, 10% grade 10+college diploma in level two, 16% grade 10+college diploma in level three, 19% in advanced diploma whereas 12% had a bachelor of science in mechanical engineering. As shown in fig. 1 (a) many of the auto-mechanics in the zone have less than 11 years of working experience. This shows that and the information gathered during interview, most automotive garages emerges within the past 10 years. As the interviewee told to me, the rest few but more experienced persons came from the neighbor capital city Addis Ababa. Even if, these auto-mechanics as well as garage proprietors despite their vast experience in automotive repair activities, most of the auto-mechanics or garage proprietors in the zone find it challenging to identify the problem and repair modern trends of different vehicles, specifically modern electronic engines. During an interview of modern vehicle proprietors and offered an eye witness on the selected garages, most auto-mechanics incompetence to repair and maintain modern vehicles due to their low levels of education. As shown in figure 2, the education level of most auto-mechanics and garage proprietors had

below a college diploma in level two with auto engine and power train service.



(a)



(b)

Figure 2, Educational Levels of a) Auto-mechanics, b) Garage Proprietors

This level of education can't solve the problem faced in modern vehicles. The evidence that collected from direct field observation and interview, most of the garage proprietors as well as auto-mechanics can't understand the service manual and even they couldn't interpret drawings. Even if, they tried to read the service manual, they have faced a problem on the name

of the newly coming automotive parts. Because the automotive garages communication media is *Italic* language whereas manuals are prepared in *English*. These types of problem could be solved by a seasonal capacity building. But, as shown in figure 3, most automotive garages could not deliver a capacity building to their experts.

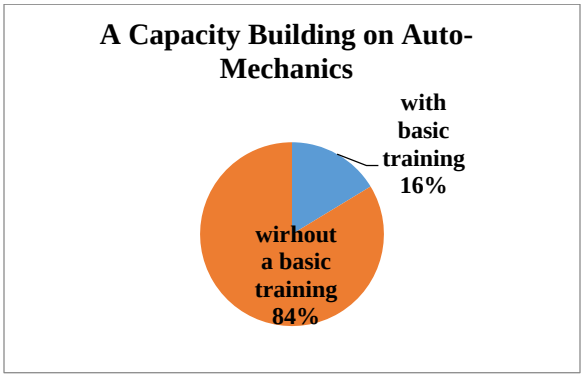


Figure 3, a capacity building on Auto-Mechanics

Moreover, to address the necessary repair and maintenance activities on the defected parts of the vehicle, at least basic adequate tools will be there on the garage. But from the data obtained through questioner and direct observation on the garage and as shown in figure 4, 78% of the respondent did not have a basic tools. As the data obtained from the vehicle proprietors and visual inspection, the garages that organized in micro level hadn't basic tools to perform tire maintenance. They have used a hammer and flat iron to separate tire and rim. This type of practice leads the rim bent due high power applied manually by hammer and takes time.

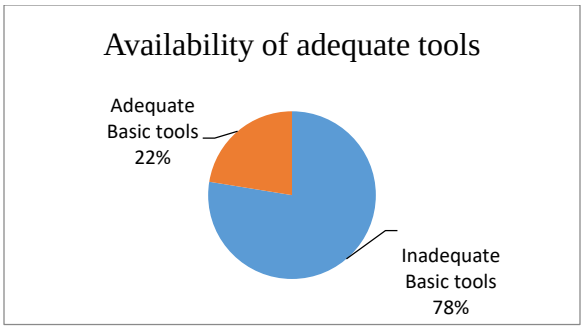


Figure 4, availability of adequate tools in selected garages

On the other hand, from the vehicle proprietor's response and direct visual inspection, 90% of the auto-mechanics used a trial and error problem solving method instead of using scanning tools. This factor as shown in figure 5, addressed due to their low level of education and the capacity of garage proprietors too.

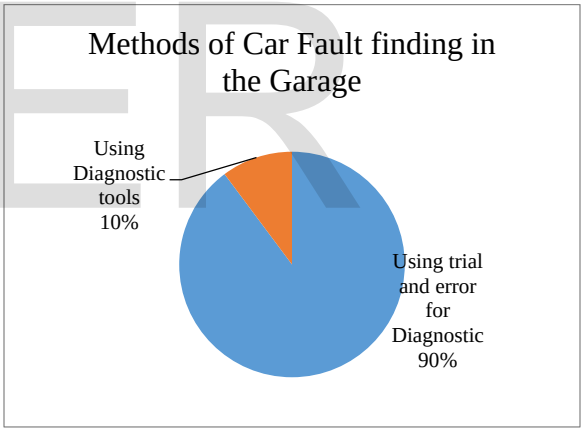


Figure 5, Methods of vehicle Fault finding in the Garage

4. Conclusion

This study assessed the motor vehicle repair and maintenance practices in different level garages. Now, most of the micro, small and medium level vehicle repair and maintenance garages in this zone tackled with several challenges such as: poor education level, absence of adequate and basic tools, and inability of using modern fault diagnostic tools, lack of capacity building or

training, lack of job motivation on the auto-mechanics and low capital resources of the garage. All the above problems made unsatisfied the customer and even they shift to other garage that makes an extra cost and time to vehicle proprietors. Therefore; to minimize the above problems, well organized training institutions in different perspective will be administered for the existing auto-mechanics as well as garage proprietors. Even if, some garages had a capital resource, but they do not want to access modern maintenance tools due to their low level of education. For the newly generated auto-mechanics as well as garage proprietors, the education system in the country level must be revised depend on the current technology implemented on the automotive industry. The governmental organizations must assist these garages to cop up with educated auto-mechanics, modern equipment's, specifically the electronic vehicle diagnostic equipment's and adequate basic tools.

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