

Optimizing Auto-Repair Practice: Akure Metropolis as Case Study

O.P. Fapetu and A.O. Akinola*

Rufus Giwa Polytechnic
Owo, Ondo State, Nigeria

*Email: <akintech@yahoo.com>

Abstract

This study investigates the problems facing auto technicians with a view to optimizing auto repair work. The data for the study were collected using questionnaire and interview techniques. One hundred and twenty auto technicians, 42 spare part dealers, and 80 car owners were contained in the analyzed sample. The result of the analysis revealed the various problems facing auto technicians in Akure to include: inadequate tools, low capital base, bad location, poor educational background and the lack of necessary social amenities in the workshops. The development of mechanic village, which was identified as one system that can help in solving most of the problems was formulated as a hypothesis, analyzed and tested. The hypothesis testing revealed that the establishment of mechanic village to assist auto repair activities would go a long way at solving the identified problems.

Keywords: *Mechanic village, auto-technician, hypothesis, low capital base, educational background.*

Introduction

The use of automobile vehicles on our roads plays a key role in road transportation system. In Nigeria where land transport is largely in use compared to water transportation and other modes of transportation, the use of automobile vehicles, either diesel or petrol driven is predominant. However, the vehicles cannot remain new forever, as the parts breakdown and wear out, and so, must be maintained. (Akinola 1995).

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. (Okah-Avae 1995; Akinola and Ogedengbe 2005).

The designs of vehicles have advanced to a very sophisticated level, and unlike the old mechanically operated vehicle systems, the modern vehicles are being operated and controlled by computerised electronic sensors. For example, latest vehicles' ignition systems are electrically controlled without employing the old use of manually reset contact breaker. Common to majority of the new trend cars is the 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 and special diagnostic equipment to analyse vehicle faults for repair and service. To ensure this for efficiency, safety, comfort and style, competent professional hands are required (Auto Tips 2001; Dhillon 1980).

As vehicle technology and maintenance processes are advancing, the problems facing Automobile technicians in the course of discharging their duties have adversely affected the transportation system, and hence affecting all the other systems in the course of

* Department of Mechanical Engineering, Federal University of Technology, Akure, Ondo State, Nigeria.

discharging their duties have adversely affected the transportation system, and hence affecting all the other systems in the country. Some of the results of the auto technician problems include: unpredictable breakdown of vehicles on the highways, failure of vehicle parts such as brakes; resulting in accidents and loss of lives, delay and failure of important appointments, and heavy debts incurred by many car owners on maintenance.

A system with an optimum performance can be generated if all problems identified are tackled (Lindley, *et al.* 1977; Jarett 1977; Groover 1992). This will go a long way in alleviating the problems being encountered by the auto technicians in our society.

The high level of usage of vehicles for both private and commercial activities coupled with the inflow of second hand vehicles popularly called "Tokunbo" brought about the need for very efficient and effective maintenance. Often times, the garages where the maintenance activities are carried out are of low capital base and are makeshift establishments either located on slippery terrains, under tree sheds, canopy made of banana or palm fronds, etc. No effective maintenance can take place in such environments.

Similarly a close look at the equipment being used reveals the level of poverty of these technicians. In most places, service pits are not available and where available, there is no reinforcement at the sides to hold loose sands in place. No accuracy of either balancing or alignment could be obtained. New vehicles are the result of technological development, which calls for literate hands to handle.

With all these facts, there is the need for a thorough analysis of the existing practice and a synthesis of a comprehensive and management oriented practice to put the maintenance culture as what it should be. It is against all these facts that this study was undertaken.

The objective of this paper therefore, is to identify and evaluate the problems facing auto technicians, so as to evolve a system, which will make them perform optimally.

Methodology

Extensive literature survey was carried out on the study. Data for the study were collected using questionnaire and oral interview. Questionnaires were designed and administered to auto technicians, spare parts dealers and car owners in Akure metropolis. One hundred and twenty automobile technicians, forty-two spare part dealers and eighty car owners who responded to the questionnaires and oral interview were contained in the analysed sample.

Data extracted from the administered questionnaires and interview were analysed using statistical tools such as pie chart for percentile analysis and the five-point Likert method of summated rating (Levin 1989; Kothari 1995).

Materials and Methods

Data Collection

In this study, questionnaires were designed and administered to auto technicians, spare parts dealers and car owners in Akure metropolis. The questionnaires as designed addressed the various problems of vehicle maintenance that auto technicians might face after considering the salient characteristics of their job.

The data for analysis covered responses from 120 owners of automobile repair workshops, 42 spare part dealers and 80 car owners. The data as collected from Automobile technician, spare part dealers and car owners were extracted and presented in graphical form.

Hypothesis Formulation, Analysis and Testing

Generally, it is obvious that automobile service and repair workshops are sited indiscriminately within our communities, which may constitute nuisance to our various communities and serve as a major restriction in curbing the problem of pollution of the environment. Also most of these workshops

are without proper environmental and safety facilities.

A hypothesis was set up based on the question as to whether or not auto technicians would like to be organized together with their colleagues doing similar jobs in a center to form a mechanic village.

The null hypothesis h_0 is that auto technicians prefer to be left alone in their scattered locations.

Hence, the alternative hypothesis h_1 is that auto technicians prefer to be organized and located in selected optimum locations.

The critical value for this hypothesis analysis was set at a significant level of $\alpha = 0.05$ as given by Frank and Althoen (1994), such that:

$$P(Z_{X/N} \geq z_{\alpha} / h_0) = 0.05. \quad (1)$$

Total area under the standard normal curve is 1, so if

$$P(Z_{X/N} \geq z_{\alpha} / h) = 0.05, \quad (2)$$

then

$$P(Z_{X/N} \leq z_{\alpha}) = 1 - 0.05 = 0.95, \quad (3)$$

therefore, the critical value is the value for which $P(Z) = 0.95$:

$$Z_{X/N} = \frac{\frac{x}{120} - 0.5}{\sqrt{\frac{(0.5)(0.5)}{120}}}. \quad (4)$$

Hence, for $P(1.64) = 0.95$ (Frank and Althoen 1994), therefore, $x = 69$. This implies that the null hypothesis h_0 should be rejected if x (x is the number of respondent that oppose the null hypothesis) is greater than or equal to 69.

As written mathematically:

If $x \geq 69$, reject h_0 .

But $x = 93$ (Frank and Althoen 1994), therefore, we have to reject the null hypothesis and accept the alternate that the establishment of a mechanic village is preferred.

Results and Discussion

Result of Analyzed Data

Fig. 1 shows that 53% of the respondents have more than 10 years experience while 42% have between 6-10 years experience and only 5% have between 1-5 years automotive maintenance experiences. An overview of this figure shows that the respondents are experienced enough to have mastered the job close to perfection. However, Fig. 2 indicates that most of the respondents do not have good educational background, which resulted in their non-willingness and inability to acquire modern knowledge.

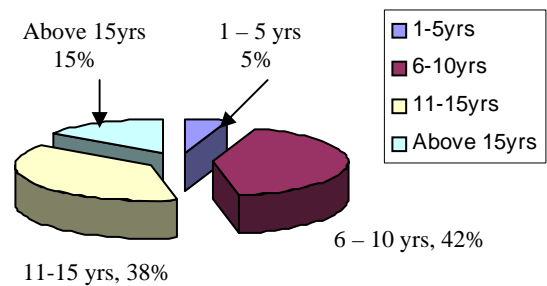


Fig. 1. Distribution of Auto Technicians in Akure in term of years of experience.

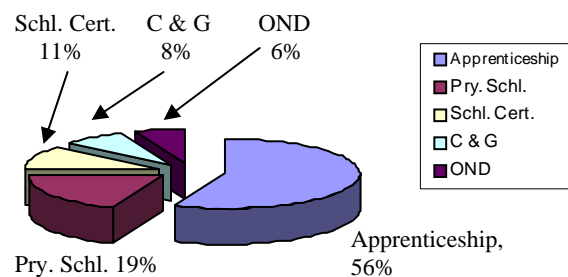


Fig. 2. Distribution of Auto Technicians in Akure according to their education level.

Fig. 3 shows that 78% of the respondents acquired the land they are using for their workshop through rent, 19% through lease while only 3% of the respondents actually purchased the land they are using. This, as the study reveals, is due to the fact that lands are not available for sale in strategic areas where location of workshops can be lucrative and the few ones that are available are very expensive

which make it difficult for auto mechanics to acquire. However, the major problem with landed facilities for this group of people was revealed by Fig. 4, which implies that only 31% of the respondents that either rented or leased land have cordial relationship with their landowner. This constitutes a great problem to auto technicians in that they are often ejected.

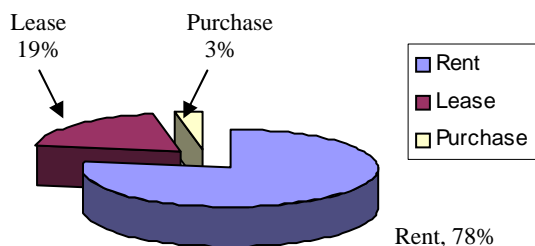


Fig. 3. Distribution according to method of land acquisition by Auto Technicians in Akure.

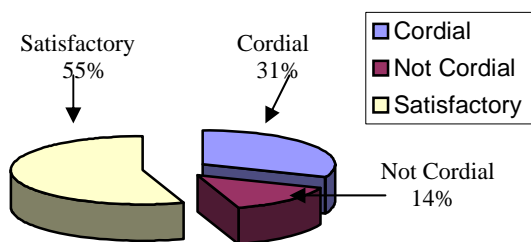


Fig. 4. Auto Technicians' distribution in Akure with reference to their relationship with landowners.

Figs. 5, 6 and 7 reflect the result of our questionnaire administration as regard other important requirements necessary in auto repair workshops, such as the availability of repair pit, standard tools and repair/trouble- shooting equipment and the nearness of the workshop to spare part stores/markets respectively. Figure 5 reveals that 64% of the respondents have repair pit in their workshop while Fig. 6 shows that only 22% of the respondents have almost all (about 90%) the tools and equipment required. This means that most of the workshops do not have all facilities necessary to facilitate work and this was believed to be associated with the poor economy in the country. This is probably one of the reasons why 67% of the respondents are sharing facilities such as pit and tools with panel beaters, painters and auto electricians as in Fig. 8. Figure 8 also reveals that it is

preferable for these workmen with almost similar but technically different job to be together in each location. This according to findings helps facilitate their works and provide for a tendency of availability of almost all required facilities.

Fig. 7 also reveals that 48% of the respondents representing the largest group have their workshops situated within 2 km of the nearest spare part stores/market as against other groups whose distance is farther.

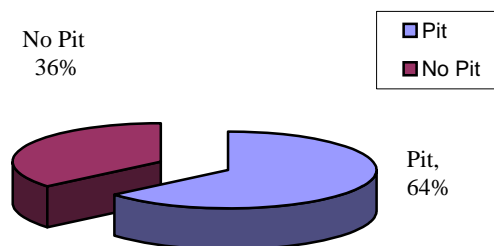


Fig. 5. Position of Auto Repair workshops in Akure according to availability of pit.

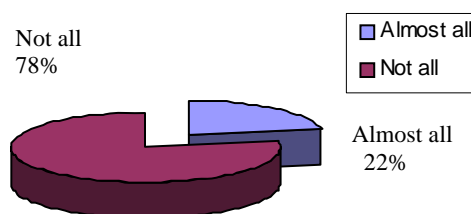


Fig. 6. Distribution of Auto Repair workshops in Akure according to the availability of all necessary/required tools and equipments

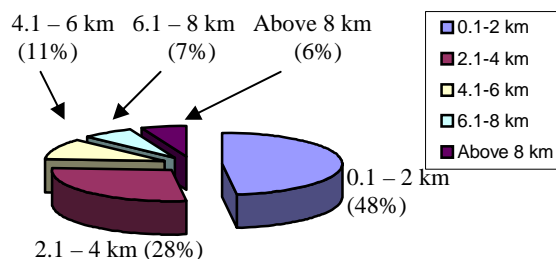


Fig. 7. Distribution of Auto Repair Workshops in Akure according to their nearness to Spare Parts Market

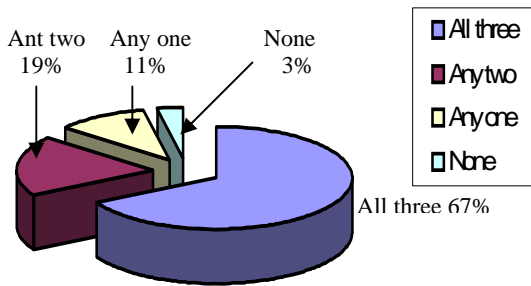


Fig. 8. Distribution of Auto Repair Workshops as they share land usage with other technicians.

As shown in Fig. 9, very few respondents (about 10%) have almost all of the parts required for purchase by their technician customers. This implies that more spare part dealers are required very close to auto repair workshops to guarantee part availability.

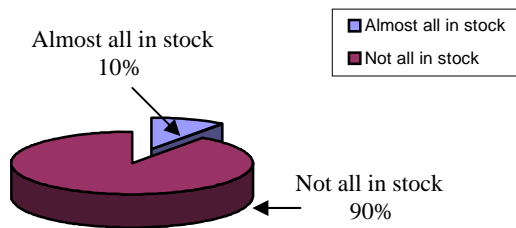


Fig. 9. Distribution of spare part dealers with respect to availability of goods in stock.

Fig. 10 revealed another problem facing auto technicians where the majority of the part dealers (80%) help their car owner customers to fix some of the part(s) bought from them. This to a large extent always deprives the auto technician of the necessary revenue/income.

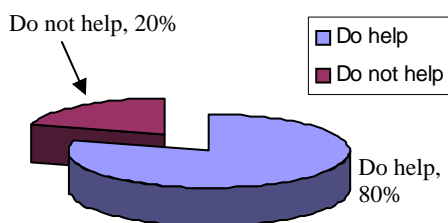


Fig. 10. Distribution of spare part dealers in Akure according to whether or not they help to fix parts for car owners.

Fig. 11 shows the distribution of auto technicians in term of minimum set-up cost.

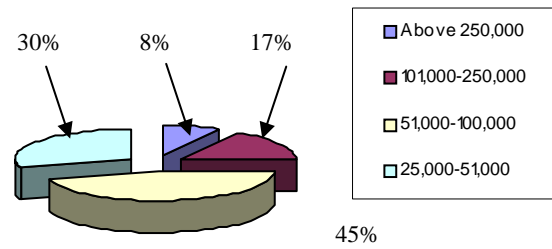


Fig 11. Distribution of Auto Technicians in term of minimum set-up cost.

From oral interview conducted, it was gathered that some auto technicians tend to advise vehicle owners wrongly. This was partly attributed to their low level of education on one hand, and greed on the other.

Observed Problems

Most auto technicians face a lot of problems in their every day practice. This calls for an immediate solution to achieving a standard workshop system with optimum performance. The problems being faced by the auto technicians are vast, but could best be summarized as follows:

Problem of Inadequate Tools

The use of inadequate/outdated/worn tools in the execution of jobs in the workshops lead car owners into unnecessary danger. Most of these technicians use tools of low quality because they cannot afford the high quality ones that enhance proper fitting required. Engines are removed manually instead of using crane or hydraulic lift. This was established in Fig. 6, which shows that 78% of the workshops interviewed do not have adequate tools while the remaining 22% that appear to have fairly adequate tools have such tools characterized with sub-standard attribute. The results are stress and consequent damage to auto parts.

Problem of Bad Location

Workshop location stands to be another major problem facing our auto technicians. A well-located workshop allows for accessibility and visibility. Fig. 3 implied that 78% of the respondents acquired their land through rent,

19% through lease and only 3% through outright purchase, while Fig. 4 showed that only 31% of the respondents have cordial relationship with their landlords. The relevant authorities do not give adequate attention to the allocation of land for auto-workshop establishment. Rather they allocate land in areas regarded as setback y to estate areas, industrial areas and some others. These allocated areas are usually very small to accommodate all the required section for auto repairs. Road expansion leads to relocation of such workshop, which have negative effect on the new set up.

Poor Educational Background

From Fig. 2, only 6% of the auto technicians interviewed were OND holders, which represent the highest educational qualification of all the respondents. Eight percents had City and Guilds Certificates, 19% primary school, 11% school certificates and 56% apprenticeship. This has caused a major setback in that most of the auto technicians are ignorant and not quite familiar with the advancing technological know-how of the trade. Some of them cannot read and write, and so find it difficult referring to instruction manuals.

Low Capital Base

Fig. 2 revealed that 75% of the auto technicians interviewed have a working capital less than a ₦100,000.00, 17% are operating between ₦101,000.00 and ₦250,000.00, 8% are operating between ₦251,000.00 and ₦1,000,000.00, where 1 USD \approx ₦118.5 (NGN, Nigerian Naira). This implied that most auto technicians' workshops are of low standard because of low capital base. Many of the technicians established workshops that can best be described as oil changing centers.

Proposed Solution

Having identified some of the problems facing automobile technicians, the following propositions towards solving most of the problems are suggested:

- Auto technicians should be educated through the organization of seminars/workshops, exhibitions and the likes for them and this can be done easily when they are together in selected locations;
- Government/wealthy individuals should embark on the development of mechanic villages that should be let out to auto technicians at a subsidized rate. However, government should enact laws restraining any auto technician from operating repair centre outside a mechanic village. This will solve some of the problems they are facing on acquisition of land facility and other necessary facilities for their workshops.
- Such village should be planned to accommodate panel beater, painter and auto electricians as analysis had revealed that when together, their productivity and efficiency are better.
- Also, availability of spare parts and easy access to spare parts market should be taken into consideration when determining the location of such village.
- Such village, it is believed will facilitate the provision of certain expensive facilities required for increased productivity that could be shared for use among the occupant of the village. This can be easily achieved as people within the same village can join together to procure expensive equipment and other facilities that are of mutual benefit to them.

Conclusion

The problems facing auto technicians have been investigated, and attempt has been made at proffering solutions to the various problems identified. The establishment of mechanic village has been identified as the best solution to the numerous problems, if backed by relevant authorities.

References

- Akinola, A.O. 1995. Parts Standardization in the Motor Industry. B. Eng. Thesis, Dept. of Mechanical Engineering Federal Univ. of Technology, Akure, Nigeria.

- Akinola, B.; and Ogedengbe, T. 2005. Basic Automobile Technology. Olajuyin Printers, Akure, Nigeria.
- Auto Tips. 2001. What your shop should know about your car. <http://www.jonko.com>
- Dhillon, B.S. 1980. Reliability and Maintainability Engineering in Engineering Digest. Diagnostic Equipment Homepage: <http://www.inct.net/auto>
- Frank, H.; and Althoen, S.C. 1994. Statistics: Concepts and Application. Cambridge Univ. Press, Cambridge, England.
- Groover, M.P. 1992. Automation, Production System and Computer-Integrated Manufacturing. Prentice Hall of India Private Ltd., New Delhi, India.
- Jarett, H.R. 1977. A Geography of Manufacturing, 2nd ed. Macdonald and Evans, Plymouth, Philadelphia, PA, USA.
- Kothari, C.R. 1995. Research Methodology. Methods and Techniques, 2nd ed. Prentice Hall of India Private Ltd., New Delhi, India.
- Levin, I.R. 1989. Quantitative Approaches to Management. McGraw-Hill, Singapore.
- Lindley, R.; Higgin, P.E.; and Morrow, L.C. 1977. Maintenance Engineering Handbook, 3rd ed. Mc-Graw Hill, New York, NY, USA.
- Okah-Avae, B.E. 1995. The Science of Industrial Machinery and Systems Maintenance. Spectrum Books Ltd., Ibadan, Nigeria.