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An Exploratory Study on Electronic Vehicle Maintenance Monitoring System for Evaluating Consumer Vehicle Maintenance Information in Oman

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Abstract:

This research has made to explore the electronic system for monitoring vehicle maintenance and to assess vehicle maintenance in the Sultanate of Oman.

Where the research deals with many factors that recommend the application of an electronic system in the automotive sector because of its importance in protecting the rights of consumers in the Sultanate of Oman, The study seeks to highlight the experiences of countries that may layer this system. For what the possibility of applying it in the Sultanate of Oman to protect consumers, the researcher suggested that data should be saved in an electronic platform so that the consumer can take advantage of this platform to protect his rights and follow up on maintenance in terms of maintenance procedures that he has undertaken to achieve a level of security in the vehicle as well as keeping guarantees and bills in this platform and also the service provider benefits from this platform to follow up the maintenance of the consumer vehicle in terms of knowledge of the maintenance required at each stage of maintenance, The study reached many conclusions according to the questionnaire he published and the interview with the specialist that consumers strongly desire the existence of an electronic system that saves their data related to the vehicle as well as protects consumers' rights in this sector if the service is not provided in the required manner by the service provider. The system also saves the guarantees data Maintenance details,

The study recommended enabling the preservation of vehicle data because of its importance in protecting the consumer, as well as for his safety from any unfair practices in the vehicle that would endanger him, incurring high maintenance and repair costs, as well as saving him from traffic accidents resulting from the vehicle's defects.

Keywords: *Electronic system, monitoring, vehicle maintenance, consumer, Oman, service provider, vehicle data, protects consumers' rights*

1. Introduction

The automotive sector is considered as one of the active sectors in the world. It is considered as strong supporter of the modern economy, and it is among the most dynamic economic engines at this time. As the percentage of sales is continually increasing and with large numbers, competition in this sector is considered fierce among vehicle manufacturers around the world, vehicle sales report at the end of 2019 shows more than 90 million vehicles sold globally, according to statistics (Statista. 2020),

The vehicle market in the Gulf is one of the targeted markets because it constitutes as an essential addition in sales to manufacturers around the world where statistics indicate that sales in the Gulf have exceeded one million vehicles annually and reached its peak in 2015, but declined slightly in comparison to previous years, because of the repercussions in economy due decline in oil prices, However, it is still considered as one of the important markets that many car manufacturers rely on.

The Sultanate of Oman is typically ranked third in total sales after Saudi Arabia and the United Arab Emirates. Their sales amounted to more than 150,000 vehicles until the end of 2018, with sales peaking in the Sultanate of Oman in 2014 to 217,000 vehicles per year. (Papua New Guinea 2017)

In light of the continuous growth of this sector follows after-sales services, which is one of the most critical areas, as vehicle agents are keen to provide them with the best services to gain customer confidence and continue to provide services, where a study confirmed the vehicles maintenance services after-sales, are one of the most critical services, and they are more profitable than selling vehicles, as maintenance continues for many years. (Bundschuh, Russell & Dezvane, Theodore.2003)

As for the Gulf region, maintenance services are available a lot, as non-agent workshops are available for maintenance and repair in every region and services, quality and cost vary, where it depends on this about the mechanism of working with vehicles, experience and knowledge in the maintenance of some vehicles.

In the Sultanate of Oman, maintenance services for vehicles are also very active, as there are many workshops of varying levels, services and costs, where it stated in the article Azzan Al Habsi - Youth (2016) that the workshops are pervasive in the industrial areas in the governorates and states, he expressed many consumers prefer maintenance to this agent, which makes them maintain the factory and agent warranty. Vehicle maintenance with the agent may continue beyond the warranty period because they believe that the agent has the competence to play this role.

On the other side, many consumers prefer to maintain their vehicles in external workshops, according to their opinion that the services in these workshops are the same as those provided by the agent, and in this way, we get the same service at fewer prices.

It stated that the Public Authority for Consumer Protection urges the agencies and workshops that provide services to include an invoice or document stating the type of services and data related to the service that was performed in the vehicle such as the used and replaced spare parts and the distance covered during the performance of the service, It states that the consumer has to read the instructions and specifications that the factory has put in place to maintain the vehicle and that many consumers do not read the maintenance manual to be able to know some things about the vehicle, for example, the type of oil, the quantity, the date of maintenance, and the type of parts that should replace so that it does not fall in the mistake and lost the warranty in the event of a vehicle malfunction, (Al Habsi, A., 2016)

This study aims at a survey study on the electronic vehicle maintenance monitoring system to evaluate consumer vehicle maintenance information in Oman, where the study will explore the electronic maintenance monitoring systems in order to assess the feasibility of introducing the electronic System in maintaining information and history of vehicle maintenance in Oman, where the study aims at whether there will be acceptance from society and the service provider from introducing information technology in this sector to take advantage of modern technology to preserve the right of the consumer and strengthen monitoring this sector of commercial fraud.

2. Background of Study

Many complaints are received annually by the Public Authority for Consumer Protection in the vehicle maintenance and repair sector in the Sultanate of Oman against either the agent or small and medium workshops. The type of complaint varies from one consumer to another, The Public Authority for Consumer Protection makes a great effort in verifying the complaint and trying to solve these problems, whether by mutual consent between the two parties or imposing the law to restore the consumer's right and in many cases, these violations are referred to the judiciary to judge the problem, especially the complex problems that the evidence lacks about from who it is a problem, Is it from the factory, from the agent, or from spare parts that may have manufacturing defects, or they may adulterate or from a misuse of the consumer? All these possibilities are incoming, and in many cases, the consumer loses his right due to the lack of evidence that contributes to establishing facts such as bills and reports The reform, because the workshop did not provide, or that this document was not preserved, which could lose the right to claim it; also, many consumers do not submit reports about the malfunctions of their vehicles as they think that they are natural breakdowns due to consumption and, may have manufacturing defects in the vehicle, and here the law forces the factory to repair this malfunction for free and according to reports shows the success of consumer protection from returning an amount in favour of the consumer may be The amount is higher if an electronic system for an observer was applied to this sector. Therefore, the study came to understand the extent to which the potential of the electronic System will benefit from improving service and consumer protection. A questionnaire was presented to the public that in the event of the launch of an electronic system that preserves the details of the maintenance of your vehicle and guarantees such as (tires, the battery.etc.) of each workshop or maintenance agent in the Sultanate of Oman did you will be used.

Where the questionnaire was used on the social media platform, Twitter, and the result was obtained from 357 people who expressed their opinion about the question, and the result was that 73% of them answered it for sure will use it. This indicates that a large percentage of consumers will turn to the electronic transformation in this sector.

3. Research Framework

3.1. Problem Definition

The General Authority for Consumer Protection receives many complaints in the vehicle sector yearly (Oman Newspaper. 2019), and there are many types of complaints in this sector

Where the consumer exposed to many types of fraud due to the consumer's lack of knowledge of his rights and lack of knowledge to know the problem that he exposed to,

He often loses his right to claim because of the lack of evidence to support his claim,

Therefore, the study came to achieve this requirement and to reach consumer satisfaction by registering and saving all the private currency of his vehicle to electronic transactions to facilitate tracking of the problem in the consumer vehicle and achieving a level of integrity in providing service and satisfaction by the customer.

3.2. Significance of the Study

This research will contribute unique novelty and originality in highlighting on the vehicle maintenance sector in the Sultanate of Oman, where it will contribute to identifying the benefits of the electronic System in this sector for its contribution in revealing the facts that must appear after the introduction of the electronic System to this vital sector,

there was no dedicated local study In this sector of how to raise the level of consumer protection so far. Therefore, the research will provide valuable support to the Consumers and Public Authority for Consumer Protection in the Sultanate of Oman, as well as everyone who deals with this sector.

4. Objectives of the Study

- To determine the problems facing the consumer in this sector.
- To improve the level of consumer protection in this sector.
- To evaluate the range of saving data of the Vehicle maintenance currently.
- To provide a recommendation to activate the electronic System to benefit entities.

5. Research Question

- What are the problems facing the consumer in this sector?
- How can the level of consumer protection in this sector be improved?
- What is the mechanism that must keep the car data currently?
- What do the data/details that are saved in the vehicle maintenance phase include?
- Will the electronic System have the feasibility to increase consumer protection?
- Will the electronic System contribute to reducing complaints in this sector?

6. Literature Review

This study came to highlight the automotive sector in the Sultanate of Oman as this sector is one of the vital sectors that need to enhance its knowledge better to protect consumer rights, as this is the first research paper in the Sultanate of Oman from this perspective.

The study aims to achieve this requirement and to suggest a new mechanism to support the monitoring and preservation of consumer vehicle data and also the study aims to achieve this requirement and propose a new mechanism to support monitoring and preserve consumer vehicle data to see details of maintenance, guarantees and prices to achieve a level of self-monitoring and analysis

In order to enable the consumer to conclude whether there is a defect in the vehicle caused while manufacturing or a defect in the quality of services provided and if any parts provided by the service provider and to maintain records of services and bills to claim in the event of any defect.

In this paragraph of the research aims at literary reviews, Books, Journal articles, Reports Published Dissertations, Scholarly or professional websites etc. to benefit and add to previous studies and reveal gaps points that were not addressed in previous studies on this axis,

- This section has divided into several topics.
- 1- Electronic vehicle maintenance monitoring system
- 2- System for vehicle maintenance history information
- 3- Defects in the manufacture of vehicles
- 4- Conclusion

6.1. Electronic Vehicle Maintenance Monitoring System

Some studies have touched on the electronic maintenance system (Furch, 2010) (Capriotti, and Smith, 2013) (Fitzgerald and Sobieski 2015) and others indicate that the electronic system in this sector will constitute a milestone in the quality of service

The Study (Furch, 2010) indicates that the electronic system used in this content is to maintain a level of quality in vehicle maintenance so that the system provides recorded information about the date of maintenance that is coming to the vehicle and that through these saved data shows what has maintained and the parts that have changed and when will the next period of maintenance

What is the matter that must include in the next maintenance? This type of maintenance is called proactive maintenance, as this maintenance aims to maintain and replace parts that start to work before the occurrence of the weather and this gives safety to the consumer and ensures that there are no surprises in the vehicle.

The aim of the study was also that the application of this type of system would have an impact in reducing expenditures on the consumer and wasting vast sums of money on unexpected reforms,

However, the study did not address the existence of the methodological research method that the writer was supposed to present as evidence; also, it did not touch on whether this system can be used over the Internet, or it will be limited to the service provider, and here there are limitations in the search as it is considered a gap in the research about the mechanism of using the system, can this data be stored and what is the period during which data can be saved for each vehicle

This Study (Fitzgerald and Sobieski 2015) has indicated the installation of a device to investigate maintenance data and details of spare parts that have been replaced or maintained. The system installed in the vehicle gives fault signals in the vehicle or expecting faults that may result in the vehicle as well as the expected maintenance date.

The system wirelessly connects with the service provider if there is a need for maintenance or replacement in spare parts and this system gives indications about the details of what has maintained and proposals in the next maintenance to avoid sudden vehicle breakdowns and the surprising cost incurred by the consumer,

Nevertheless, note that the points that were not mentioned in the first study where this gap was addressed in terms of number and enabled on a fleet of vehicles, and here the strength of this study lies in using the electronic system to save and process data for the vehicle, As it is known about the most common problems in one type of vehicle and trying to remedy the defect quickly without losing time in detecting faults so that spare parts are provided on time. Through the system, the period is calculated that should be done regular maintenance before any sudden ruin.

This study has shown that the way to manage vehicle maintenance information is by inventing an electronic system that saves vehicle data according to the data obtained from the vehicle owner and service provider about everything related to the vehicle maintenance schedule, vehicle parts, repair requirements, vehicle maintenance costs, and things that the consumer can add to the data for this vehicle,

This study aims to take advantage of the technology to facilitate the process of saving vehicle data to the consumer using modern means of communication

By way of example, and not limited to the use of text messages, instant messages, e-mail and other communications devices, so that the consumer can obtain vehicle-related information and maintenance recommendations. Also, the service provider will be able to obtain the vehicle information and the correct maintenance methods according to the factory controls. also, one of the objectives of the proposal for this system is the efficiency of accessing it via the Internet with ease, and the system also provides the service provider with direct information for vehicle maintenance from the factory, the system also provides the necessary alerts to the consumer about the necessary maintenance according to the data recorded for some consumer parts that are due to be changed to avoid sudden damage, (Capriotti, and Smith,2013)

However, the study did not address more broadly the benefit that the consumer will gain from this system in detail, as well as whether the customer will include data that pertain to his vehicle including changing tires and batteries that need to be changed according to the period.

7. Methodological Approach

It will include the research methodology as it is new research in Oman the Exploratory research design because such research has not done before in Oman, The researcher will use the data collection method Primary data and secondary data.

The Public Authority for Consumer Protection receives many complaints in the vehicle sector annually, and there are many types of complaints in this sector, where the consumer is exposed to many types of fraud due to the consumer's lack of knowledge of his rights and lack of knowledge to know the problem that he is exposed to the consumer often loses his right to claim because of the lack of evidence to support his claim.

Therefore, the study came to achieve this requirement and to reach consumer satisfaction by registering and saving all the private currency of his vehicle to electronic transactions to facilitate tracking of the problem in the consumer vehicle and achieving a level of integrity in providing service and satisfaction by the customer and the study comes to answer the research questions,

- What are the problems facing the consumer in this sector?
- How can the level of consumer protection in this sector be improved?
- What is the mechanism that must keep the car data currently?
- What do the data/details that are saved in the vehicle maintenance phase include?
- Will the electronic system have the feasibility to increase consumer protection?
- Will the electronic system contribute to reducing complaints in this sector?

The research will also depend on obtaining the data on the primary and secondary data according to the details below:

8. Population of the Study

The study questionnaire is open to all consumers to reach the largest possible segment of those to whom the study applies, and they are all residents and expatriates, who own a vehicle where the study targeted everyone who owns a vehicle to explore irrigation around the study, where citizens and residents were followed by the researcher through the social media platform to find the sample to get accurate results.

9. Sampling Technique and Sampling Size

9.1. Sampling Size

Since the consumer who an owner of the vehicle in the Sultanate of Oman is the target in this questionnaire, therefore the response to reception may be tremendous, where we allocated a short time of 24 hours. We used snowball technology to reach the target segment using social media platforms such as WhatsApp and Twitter. The goal was 300 samples and was achieving this goal and increasing the samples until we reached 312 samples, where we stopped the questionnaire. This means that 102.2% of the target sample size has been achieved.

9.2. Sampling Technique

Samples were taken through the snowball technique between the researcher's societal relationships hierarchically. The questionnaire questions are passed along with the recommendation to several people who meet the conditions (Atkinson, R. and Flint, J, 2001). It owns a vehicle in the sense that the owner of the vehicle. Hence, he uses the

vehicle so consider him as a consumer, and he used social media programs to distribute the fourth link of the questionnaire, which was used on Google Forms to organize methods and prepare samples.

10. Justification of Select the Research Method

The research is based on the survey method for the following reasons: The survey of research studies is considered one of the most accurate surveys in extracting results from people, whether within the community or from outside the community. It depends on the focus on the selected samples that the research applies to extract realistic and correct results in the percentage that contributes to the success of the research, where the survey allows the researcher to reach the research sample either through direct meet or through a communication or through social media programs such as WhatsApp and other programs as it ensures that the proportion of respondents is more significant. Thus an investigation of realistic answers, as it contributes to this matter is the lack of disclosure of the identity of the respondent and the questionnaire, which makes him answer it freely and frankly, consequently, the survey is more effective and reliable in providing such descriptive capabilities that guarantee the results of the samples more accurately and give to make decisions based on that.

11. Research Design

The research requires a pleasant and harmonious design for the researcher to communicate the idea of research and proper research, through which successive ideas seem to make clear and to convey the approach to the reader (Maxwell, 2012)

As the design of the study makes it easier for the researcher to search the task in terms of information sequence and duplication, Therefore, the research design links the research aims, research questions and results that are expected to be extracted from the research.

The literature suggests research designs in various forms including analytical, experimental, and descriptive analysis, the research mainly depends on the design of quantitative research, as the masses of the latter target of consumers in the Sultanate of Oman who owns vehicles and they come to search for an opinion poll about the implementation of an electronic system to achieve consumer protection in this critical sector, the research focuses on extracting results from a questionnaire, which includes 13 questionnaires derived from the goals and outcome research, for the researcher to be able to pass on the consumer's opinion in case of applying the system,

Consequently, quantitative research achieves the desired results from the required facts to complete the research stages, and the results will be produced.

12. Research Limitation

Research differs in terms of topics, the nature of research, the degree to be achieved, or the societal benefit of the study but all research faces a limitation, as this limitation poses a challenge to the researcher on how to treat it or access it where everything cannot be completed as there must be restrictions facing the researcher and the research for example but not limited to nature, political conditions, and societal constraints (Library.sacredheart.edu 2020).

The limitations of this research are the process of conducting face-to-face interviews with employees and specialists, where this research coincides with the coronavirus (Covid-19 pandemic).

In light of these conditions, meeting with employees or officials responsible is very dangerous from the spread of the virus, as the researcher exposed to this virus the period of the research, which led to his restriction in communicating with the concerned parties to conduct interviews and limit the employee to trying to contacting by phone.

13. Legal, Ethical and Social Issues

An increase in depth in research leads to ethical and legal problems that the researcher must avoid using the pre-approval approach (Johnstone, 2009).

From this standpoint, the researcher is keen to get the acceptance of the consumer and his freedom to answer the questionnaire or refrain, as this is one of the consumer's rights to take part or not; the researcher pledged that the data which obtained will be confidential and will not show any name or data of the questionnaire, It will not give to a third party for viewing or use in any activity mentioned; also the researcher did not ask for any personal data related to the participant, whether making sure that he owns a vehicle, and he is thus considered a consumer and the aims of the questionnaire apply to him.

14. Data Analysis

Through this chapter, the researcher seeks to get consumer opinion through a questionnaire about the possibility of the electronic system to solve a problem that it faces in this sector in the Sultanate of Oman, as this chapter deals with the mechanism of collecting and analyzing data from the questionnaire samples that taken earlier, the researcher has targeted samples through social media platforms such as WhatsApp, Twitter, etc. The researcher has reached many different groups of society in the Sultanate of Oman, whereas, the research attracts the attention of the consumer who owns and uses the vehicle, as 312 respondents obtained from the survey questions,

The researcher has touched on the needs of the consumer and his opinion of entered the technology and accepted to protect it in this sector.

15. Data and Research Methodology

Through the aims of the Study that the researcher seeks to achieve by using the descriptive approach to analyze the data that done through the questionnaire and interviews about the possibility of applying the proposal and its effectiveness in achieving the goals of this research,

Where it clarifies accurately through the quantitative deduction of data from the possibility of reaching the goals set by the researcher and can extend to reaching any conclusions that will contribute to consumer protection in this sector.

15.1. Population of the Study

The target community in this Study is every consumer who owns a vehicle and lives in the Sultanate of Oman; As the Study includes citizens and expatriates, they are considered consumers in terms of principles and the research took a short time for the sample size and the vast geographical area of the questionnaire, where 312 samples received within a specific and standard time frame within 24 hours of starting the questionnaire using social media programs.

16. Timeline for the Questionnaire

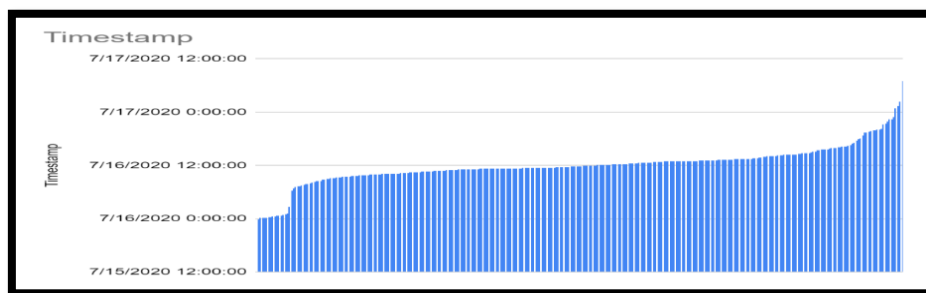


Figure 1: Timeline for the Questionnaire

The time limit of the questionnaire is 24 hours, during which time the researcher published the questionnaire through social media programs. The questionnaire achieved a widespread according to the snowball technique, as the recommendation led to the achievement of 312 samples within a short time, as it is considered a record time and this technique contributed to ensuring the completion of the questionnaire quickly during record time.

17. Interview

The research presented an appointment for a telephone interview with a specialist in the subject of consumer complaints in the vehicle sector.

The meeting took within forty minutes, the researcher talked with the specialist about the aims of the study and the desired results and gave a summary of the purpose of the Interview, The researcher has confirmed that the information and data will be confidential for the research only, The parties discussed on consumer protection in the automotive sector and what are the most prominent challenges facing the Public Authority for Consumer Protection in this sector,

18. Conclusion and Recommendation

18.1. Findings

The protection and preserving maintenance data will raise the level of control in the automotive sector, Through the questionnaire, the results were favorable to a large extent, as the percentage of strongly agreeing with most of the direct questions exceeded 50% of the strongly agree results, and more than 25% of agreed; thus the application of this system in the Sultanate of Oman will have a significant impact in raising the level of consumer protection and achieving a level of satisfaction, The research concluded with many results according to the following;

- One of the most prominent problems facing the consumer in this sector, in which the case leads to raising the complaint to consumer protection, is in the first place the technical defects in the vehicle. Secondly, the parts that are counterfeit or have a technical defect, and lastly the services provided by the service provider such as repair, change and paint.
- The questionnaire has achieved impressive results in that reaching a level of satisfies the consumer in terms of protection is to raise the level of control by applying an electronic system that saves the vehicle and service provider data.
- The questionnaire has achieved impressive results in that reaching a level of satisfies the consumer in terms of protection is to raise the level of control by applying an electronic system that saves the vehicle and service provider data.
- There is no vehicle data connection between the service provider and the customer at present, except for those in the agencies, and the customer cannot view it either through the agent.
- The data that must be saved will include everything related to the vehicle, including maintenance, repair, battery change, tires, Etc.

- The electronic system will achieve the necessary protection of the consumer in this sector, as it will have the effect of raising the level of control over the service provider to avoid any risks to which the consumer is exposed in this regard, and this will lead to a reduction of complaints in this sector.

18.2. Recommendations

Consumer protection is a difficult task in light of this accelerating world in industry, trade routes and the different commodities available in the market. Where the study aimed to identify the vehicle maintenance sector in the Sultanate of Oman highlighted on most of the problems that consumers face in this sector, and recommend solutions that will benefit the consumer and protect his rights also obligations of the service provider, So the researcher concluded with recommendations including:

18.2.1. Consumer

The consumer should be aware of the necessity of using and providing data storage for his vehicle through the electronic system from the date of use.

Where he will be able to realize the need to perform some maintenance for some parts that have come time to change in addition to that the system will protect documents, guarantees and service details for the length of the vehicle's use, and this will give the consumer knowledge of the expenses and maintenance details for each stage.

18.2.2. Service Provider

Recommend that the service provider responds to entering consumer vehicle maintenance data to maintain the credibility and transparency of the service provider according to a joint plan between all parties.

It provides the service provider with a vehicle database to make it easier for him to know the vehicle's maintenance history, the procedures that have taken place, and the treatment of a defect that may be missing in the previous services, in addition to the possibility of issuing an electronic invoice directly to the consumer's account, thus avoiding losing this procedure and exposed to a violation according to the Protection Law Consumer.

18.2.3. Public Authority for Consumer Protection

The researcher recommends that there be a direct link through the program with the General Authority for Consumer Protection, where in the event of any complaint in this sector, the consumer submits a claim through the electronic system to facilitate the consumer following up the claim electronically supported by the reports available in the system,

it also recommends the necessity of compulsory implementation of this program for all service providers to create a database to serve future studies of vehicles in the Sultanate of Oman.

19. Future Research

The electronic systems at present do the work of organizing business more accurately, quickly and reliably, as these systems facilitate the work of procedures and increase the level of control, which is often more accurate than the usual methods, the Sultanate will benefit from this system to apply it in many sectors to achieve a level of Discipline; therefore,

for the future studies suggest to the existence of an electronic link between this sector after the application of the system is compulsory, in which all parts of spare parts registered via barcode and the price of service in the system to achieve more protection for the consumer, transactions will be entered electronically so that the service provider records the invoice through the system. Here, the system will know the price of each part to avoid any price manipulation for each service provider, and thus the prices of spare parts and services prices will be unified.

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