International Journal of Advanced Science and Research
ISSN: 2455-4227
Impact Factor: RJIF 5.12
www.allsciencejournal.com
Volume 3; Issue 4; July 2018; Page No. 39-45

Automatic mobile ticketing system for traffic offences

Gershom Chishala[1*], Dr. Alice P Shemi[2], Maybin Lengwe[3]
[1, 2, 3] Computer Science Department, Copperbelt University P.O.Box 21692, Kitwe, Zambia

Abstract
Currently traffic offences ticketing process in Zambia is manual (paper based). This makes it difficult to track the ticketing and payment of fines from the ticket issuance time to the time of payment for the offence. Receipts and money retained by the police after such payments can be easily misplaced. The purpose of the study is to design and build a mobile based ticketing system for the Zambia Police traffic. Interviews and questionnaires were used to get preliminary data on the current ticketing system. A feasibility analysis was undertaken at the Road Traffic Services Agency in Kitwe to obtain system requirements. Tools used include php, Android studio and java programming language, XAMMP was used as web server and MySQL as a database management system. The impact the automated ticketing system will have, include secure storage of ticketing transactions, easy to follow up transactions hence directing the funds into government coffers.

Keywords: ticket number, receipt number, automatic ticketing system, short text, message

1. Introduction
Traffic offence ticketing process in Zambia is currently manual hence time consuming, inconvenient, costly and prone to a lot of errors. This research Both time and effort are saved and because people are eager to use technology (Puhe, *et al*., 2014) [23] it is easy to have it implemented and usage assessed[1]. Automatic Ticketing System (ATS) has been proposed to solve problems that come with the current ticketing system for the Zambia Police Service. Improving speed, information management, reducing operational costs and human errors, and enhancing accountability of receipted money. Automatic ticketing system is the automation of the manual ticketing process currently used by the police traffic officers.

Currently, traffic offenders are issued with a paper based ticket. They are then asked to go and make payments at the police station while the vehicle is in most cases impounded until such payments are made. When the payment is made, copies of the receipts are stored in paper cabins.

Implementation of ATS will also see reduction in inconveniences to motorists related with impounding vehicles until the money for the offence has been paid. Currently the traffic officers have been equiped with an electronic offence detector for exceding speed limit but have no way of storing the information generated. This project also adds an Android QR/Bar code scanner for offences like expired road tax, expired test certifcate and expired insurance. Furthermore a sure data be for all traffic violation detection has been provided. While (Leoncio & Camata, 2017) [15] proposed to automate the ticketing System traffic and safety divission for MMDA and generate reports, the system did not provide for offline use when there was no internet which this project has addresed. This system does not involve use of printed tickets but electronic tickets in form of SMSs. An android Application is used to enter the offender details and later generate ticket which could be sent to the offendr's mobile phone for payments at the bank. The police Adminstration are also provided with the dash boad with which they can monitor all the traffic violation ticketing transactions in real time as they occur. Regular pdf reprts can thus be printed.

1.1 Background
The ticketing of traffic offences in Zambia is currently manual or paper based. This has had negative effects like traffic jams, frustrations as a result and consequently temptation to engage into corruption in order to get out of it quickly and proceed with your business (Chirwa, 2004) [9]. The payments for the traffic offences are paid at the police station or police check point. Putting the police in the chain of handling cash for the offences committed tempts them to abuse power by engaging into corruption. The Road Traffic Act (Anon., 2013) [2] gives a police officer power, on behalf of the government, to enforce law and order on the roads. At the same time, collect money for the said offences. According to (Alex, 2009), this does not just divert the effort and attention from executing their duty but also encourages them to do corrupt activities.

According to the ministerial statement given in Parliament by the Minister of Home Affairs Hon. Steven Kampyongo on 15th November 2016, the minister stressed that the traffic check points result in inconvenience and frustrations to motorists especially that they are manual. Manual issuance of tickets leads to queues, traffic jams and frustrations.

2. Notations
2.1 Use Case Diagram: For the design of this system, different notations have been used to help show exactly how the system will be implemented and one of them is the use case diagram below. A use case diagram illustrates in a very simple way the main functions of the system and the different kind of users that will interact with the system.

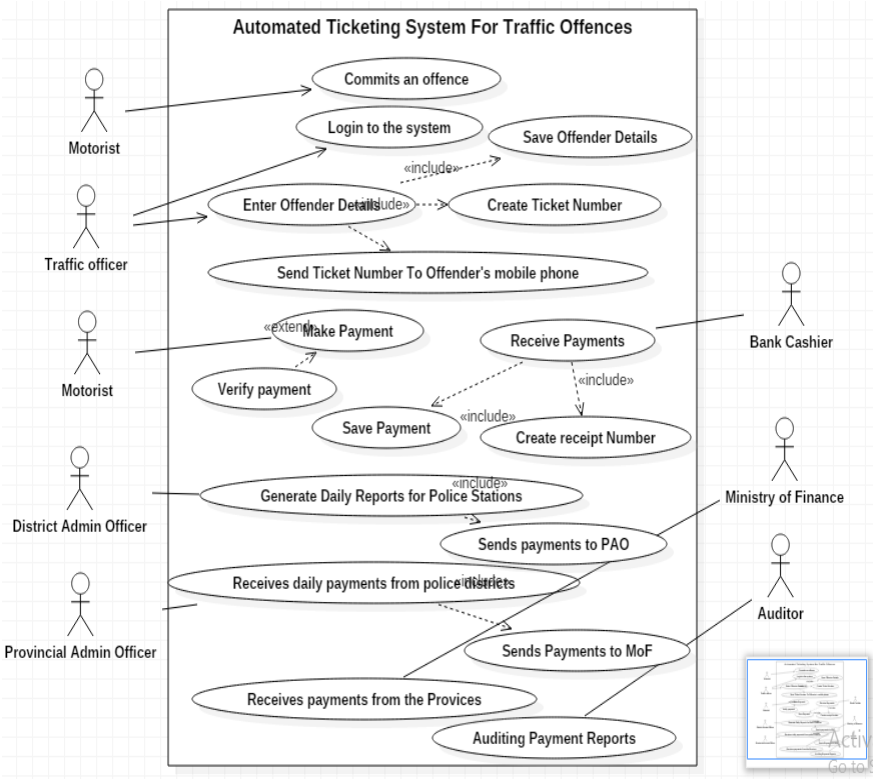


Fig 1: ATS use case Diagram

For the proposed automated ticketing process, the Police logs into the application and enters the offence against the motorist, the fine is automatically attached to the receipt. The receipt is then generated and sent to the motorist mobile phone.

The motorist can now go and pay at any payment post. The remote distributed database is expected to be able to synchronize with the host.

2.2 Sequence Diagram

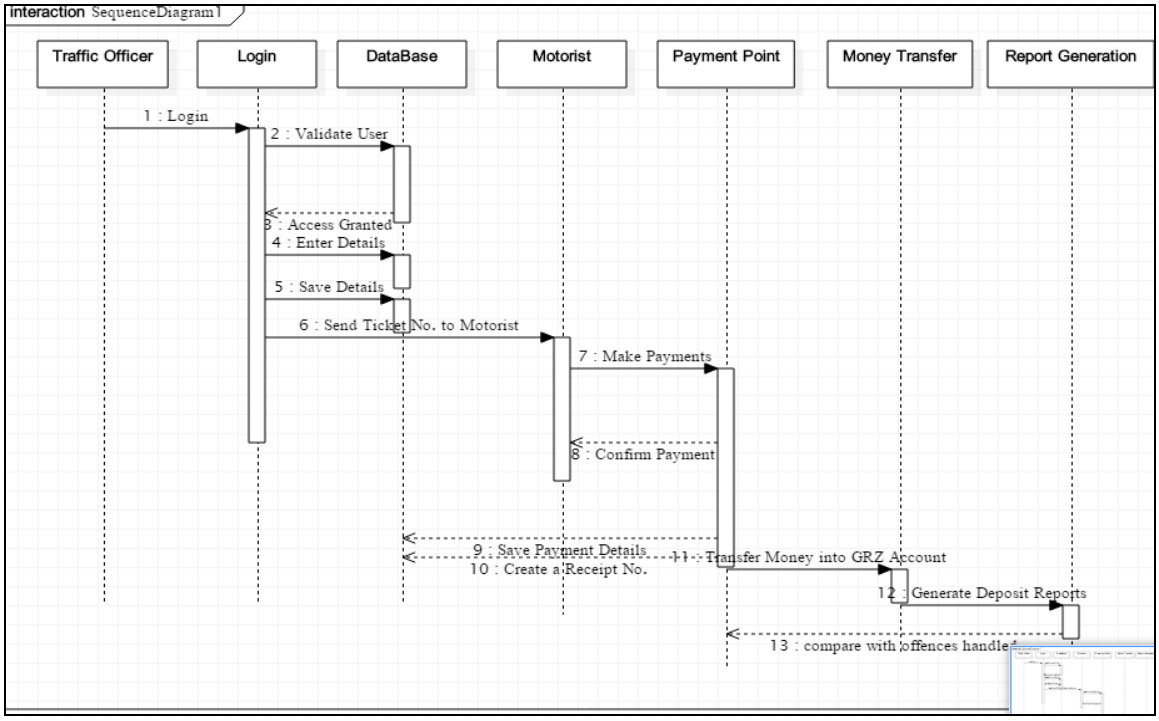


Fig 2: Sequence Diagram

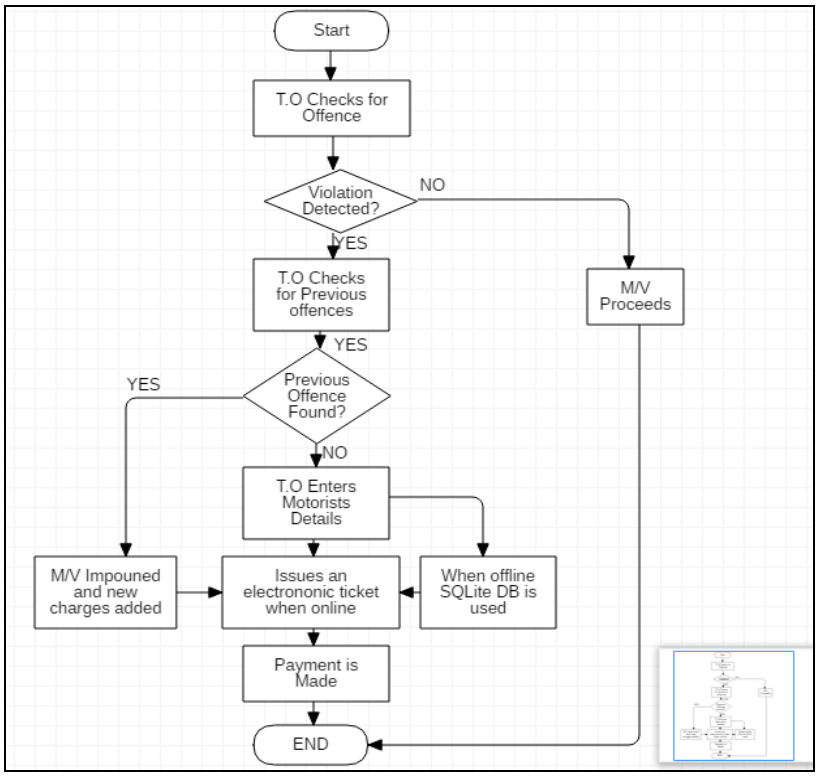


Fig 3: Flow chart diagram

The flow chart diagram above depicts the flow of the Ticketing Process for traffic violations from the time the Traffic officer (T.O) identifies the offence to the time the payment is made by the traffic offender or proceeds if no offence has been found.

3. Materials and Methods

3.1 Methodology

Data about the current ticketing process for the traffic offences was collected from police stations in Kitwe district. Star UML was used to design the electronic ticketing process. Android Studio was used to develop the mobile ticketing application. MySQL was used to create a Database for storing ticketing information and SQLite was used to create the Android database. PHP was used to create the web pages for the bank and Police Administration.

Statistical Package for Social Sciences was used to code and analyze the quantitative data from the questionnaire. Data from other sources like interviews and observations were transcribed and manually coded.

3.2 Administering the Data Collection method

The questionnaire was modified several times before adoption for the survey in order to ensure clarity before they could be launched. An Information cover was provided in the questionnaire to explain the purpose of the questionnaire; it further assured the participants that the information would be treated with utmost confidentiality.

3.3 Questionnaire Distribution

The target group of respondents included key players involved in the use of the traffic offence ticketing system particularly the Zambia Police Traffic Officers at different levels of ranking. Questionnaires were submitted to Police Officers who were involved in the process of issuance of the traffic offence tickets which included Traffic sections at the following Police Stations; Kitwe Central, Wusakile, Riverside and Nkana East Police Stations.

The number of questionnaires distributed per station depended on the size of the police station and number of officers in the department. A total of 44 questionnaires were distributed to all identified stations and officers. Out of the 13 questionnaires administered, 8 were successfully answered giving approximately 61.54% of all respondents. Table 3-1 shows the questionnaires distributed and the actual returned.

Table 1: Questionnaires Distributed and actual Returned

Target Group	Number of Questionnaires Administered	Actual Returned	% Achieved
Stations			
Wusakile Police Station	3	1	33.3
Kitwe Central Police	3	3	100
Riverside Police	3	3	100
Nkana East Police	4	1	25
Total Questionnaires	13	8	61.54

4. Results

Upon completion of the development of the ATS, the tests were done to check whether it performed according to system specifications. The figures below show the user interfaces for the Android Application and the browser application are

shown together with a snap shot of SMSs generated during testing. The system is able also to pick the transactions like the pending payments and update the payments once made. Pdf reports can then be generated at police Administration Offices on a regular basis for future other uses such as auditing.

The Mobile Application in fig 4 shows the two input interfaces for both online and offline instances. When the data is entered offline, it is saved in the SQLite data base and can later be updated when within the network range.

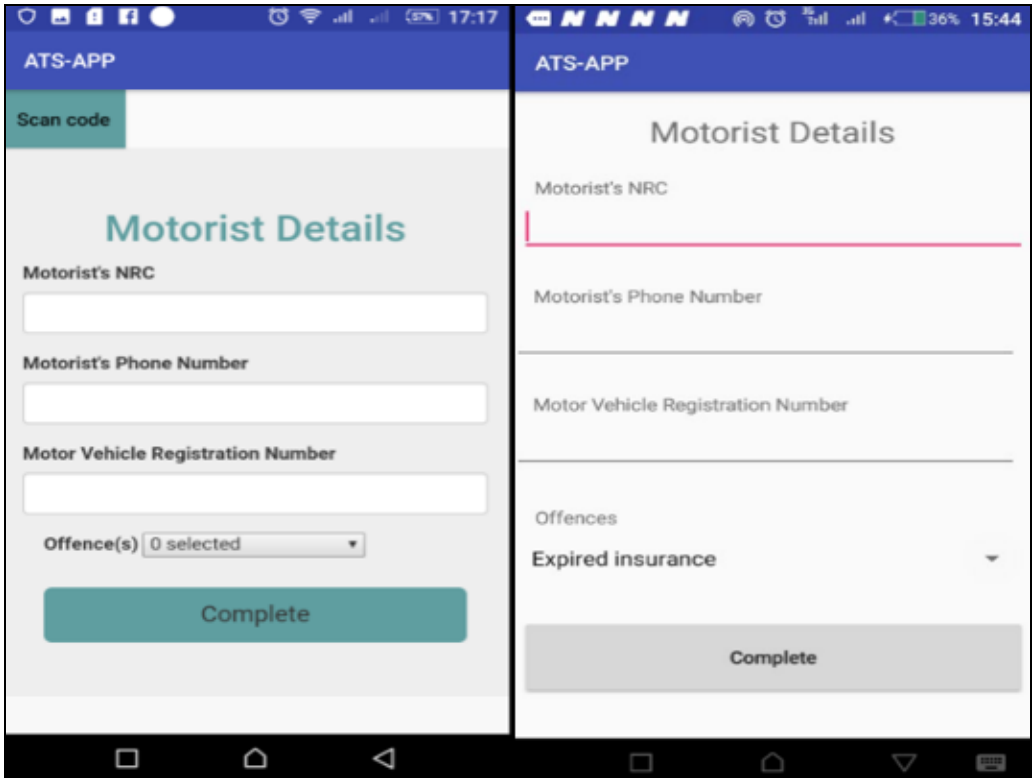


Fig 4: ATS user interfaces for online and offline.

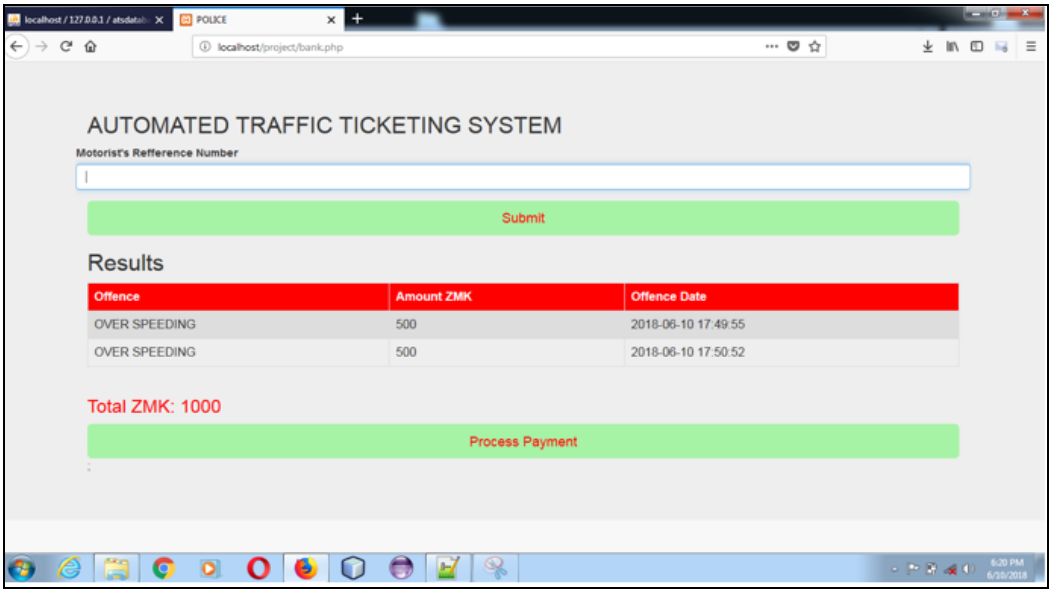


Fig 5: ATS Bank Dash Board

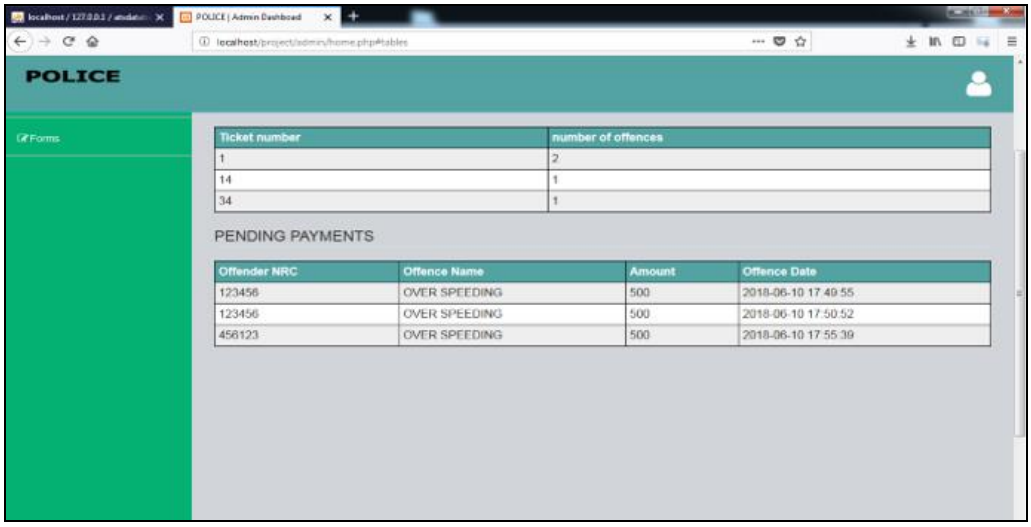


Fig 6: ATS Police Dash Board

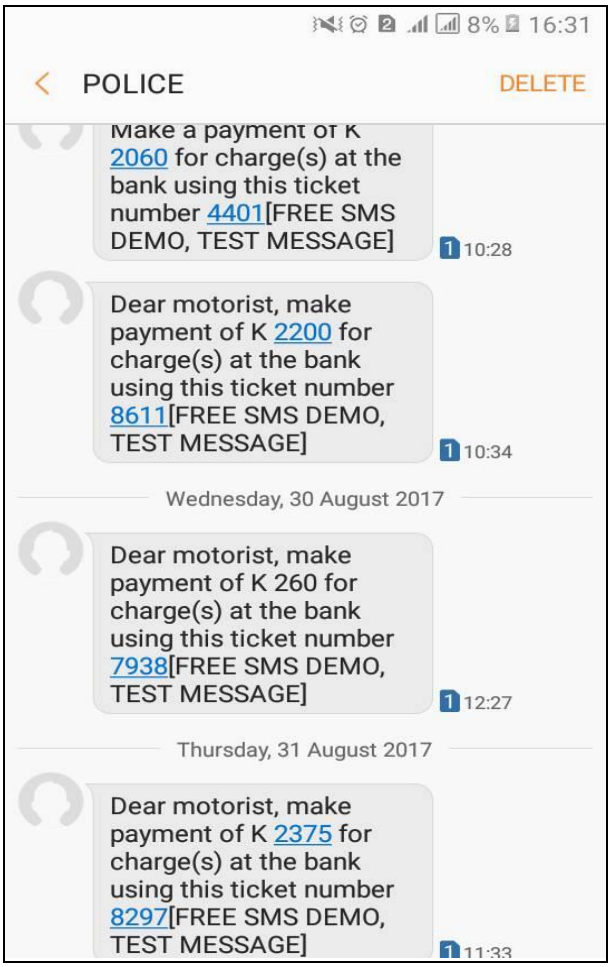


Fig 7: Sample Messages

The tables below show a summary of the offence detection used i.e. whether physical (done by a police officer) or electronically, the form of ticket and its process; whether it is manual or electronic, the Mode of Payment; whether it is done at the bank or at the Police offices and the Mode of data storage; whether paper based or electronic based.
SPSS was used to analyze the data in the tables.

Table 2: Percentage deference in traffic offence detection

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Electronic Gadget	1	16.7	16.7	16.7
	Police Officer	6	83.3	83.3	100.0
	Total	7	100.0	100.0	

Table 3: Percentage difference in between Manual and electronic Ticketing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Electronically	2	28.6	28.6	28.6
	Manually	5	71.4	71.4	100.0
	Total	7	100.0	100.0	

Table 4: Percentage of payments made at the police station

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Police Offices	7	100.0	100.0	100.0

Table 5: Percentage deference between manual and electronic storage of ticketing data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paper/Cabinet	2	28.6	28.6	28.6
	Electronic Data Base	5	71.4	71.4	100.0
	Total	7	100.0	100.0	

4.1 Analysis of the Speed, Errors and Cost

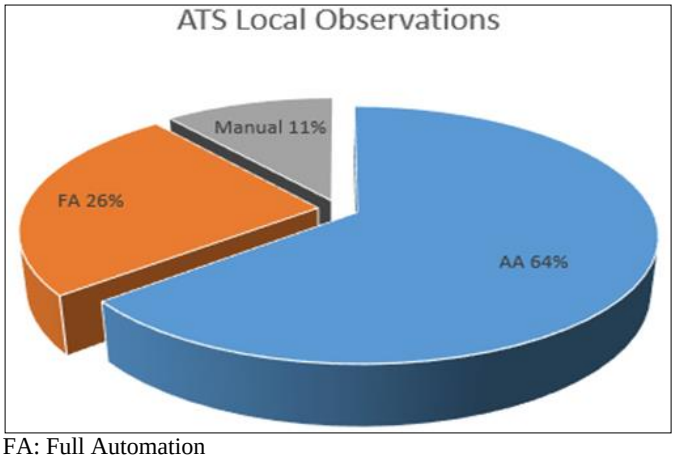
The tables below show the observations made by the researcher on the Automated Ticketing System based on Speed, Errors and Cost versus Level of Automation. The recorded data from respondent's observation was also considered.

Table 6: Level of Automation and Trust/Reliability evaluations

Type of Automation	Trust	Reliability
Full Automation (OOTL)	Agree	Agree
Adaptive Automation AA)	Strongly Agree	Strongly Agree
Manual	Strongly isagree	Disagree
Localized results	Adaptive Automation	Adaptive Automation

Table 7: Level of Automation and Localized Results evaluation

Type of Automation	Errors	Cost	Speed	Information Management	Rating in %
Full Automation	Agree has no errors	Agree has less costs	Agree speed is fast	Agree	26
Adaptive Automation	Strongly Agree has no errors	Strongly Agree has no costs	Strongly Agree speed is fast	Agree	64
Manual	Disagree has no errors	Disagree has less costs	Strongly Disagree speed is fast	Strongly Disagree	10
Localized Preference	Adaptive Automation	Adaptive Automation	Full Automation	Adaptive Automation	Total 100



FA: Full Automation
AA: Adaptive Automation

Fig 8: Pie Chart showing ATSs Results in relation to levels of Automation

4.2 Discussion

As can be seen from table 1, more than eighty percent of the detecting an offence is done by the police officer without the aid of an electronic gadget. This subjects the police officer to personal judgment which may be prejudiced. It is also difficult to capture, store and present evidence of certain offences if need to go to court arises.

According to recorded data from the questionnaire, and as shown in tables and the receipts and the money collected from the revenue for a moment is kept in the administration officer's office and later the cash is taken to the bank while the paper receipts continue to stay in the said office indefinitely. This has the problem of having the receipts catching fire, getting lost or misplaced and the time the money stays in the office is enough to have it stolen or misplaced by anyone having access to the office.

For those that manage to make payments there is no way of verifying whether the money will reach the Ministry of Finance which is the final recipient or not. Each province has a separate bank account to which the Police Stations deposit their money. These different Stations' accounts then get transferred into a single bank account accessible to the Ministry of Finance. With these different bank Accounts, it is easy for the money to find itself somewhere else as the numerous transfers are made.

Table 3 shows that seventy-one (71) percent of the ticketing process is manual and only twenty-eight (28) percent of the system are electronic. The entire current Ticketing System has no consolidated reporting mechanism for the various activities of the traffic operations, which leaves loop holes for misappropriation of government revenue. During data collection through questionnaire, a good number of traffic officers were not able to give us the desired data as they thought that they were being investigated, however an analysis of the collected data was made using SPSS and the proposed design made.

The information in table shows the average interview and observation results from both the respondents and the researchers based on the ATS's level of automation versus reliability and trust. The results show that for the current local technological environment, Adaptive Automation is favorable so that tasks could be shared between human and automation. The researchers concluded that ATS therefore was reliable and could produces trusted transactions.

Table shows evaluation results from observations and interview questionnaires ATS's reduction on cost, errors, increased speed and improved information management. The final results show that this project improved the operation of the traffic ticketing system in reducing the cost of ticketing, improving information management, improving the speed of ticketing process and reducing in human errors. It was also observed by the researchers that ATS's adhered to the theories of levels of automation given the local scenario. Figure 4 shows a summary of the observations made during the system analysis and interviews. Results therefore show that ATS conform to the theories of automation and is capable of eliminating the costs and errors prone with manual ticketing and increase the speed of ticketing process.

5. Conclusion

The results of the findings strongly suggest that the proposed system will help in eliminating the inconveniences to the motorists, human errors, and costs and improve information management. Implementation of the web server based mobile ticketing system for traffic offences will enhance service delivery to the general public as a direct result of reduction of traffic jams. Motorists will not have to be inconvenienced by having their vehicles impounded and they will be more confident that the money they are paying is going into government coffers and not the individual traffic officers. The manpower requirements for the traffic officers will be reduced and the ticketing information will be stored in a more secure manner than the paper based system.

The detecting gadgets help to remove prejudice that can be prevalent in the manual ticketing system. Manual/paper tickets are eliminated by providing a more secure electronic storage of ticketing transactions.

Although Puhe *et al*, (2014) [23] argued that Android applications as used in the ticketing systems lacked platform interoperability, I strongly support its use in this project because almost all smart phones in this country (Zambia) use Android platform. I also agree with Subarnarekha *et al*, (2014) who pointed out the security risk of using cloud database despite its easy maintenance and convenience.

ATS has the functionality that provides electronic receipts to

the traffic offender upon making a payment for the offence. The dash board at the police station is monitored by administration senior police officers as field traffic officers operate also assists in providing accountability on part of the traffic officers. When an offence is entered against a motorist, the dash board is able to pick and show the offence details and as to whether the motorist has made the payment or not. The electronic ticket issued after the payment has been made and can be used to track the payment. The police district administration officer receives daily reports from police stations and later the police provincial administration officer gets the traffic reports from the district administration officer. The reporting system also provides a basis for the financial auditors to audit the ticketing transactions.

6. References

1. Ahmed HA, Yaqub AM, Bouk HS, Kim D. SmartCop. Mobile Information Systems, 2016, 12.
2. Anon. Road traffic Act, Lusaka: Government Printers, 2013.
3. Bakri Y, Akeed Y, Thornat P. Comparison between contineous and batch processing to xylanase. Brazilian journal of chemical engineering. 2012; 29(03):441-447.
4. Bhuvaneswari M, *et al*. Embeded System based Automatic Ticket Vending machine for modern transport System. International Journal of advanced resaerch in computer and communication engineering, 20134251-4255.
5. Brydon Miller M. Action research, New Dheli: SAGE publications, 2003.
6. Byeng D, Kyung K. Selecting probalistic aproaches for reliability based design optimisation. AIAA Journal. 2004; 42(01):124-131.
7. Chandra P, Keshari K, Soni P. RFID-Based ticketing for public transport system: Pespective megacity. international journal of advance research in computer science and management studies, 2014, 187-192.
8. Chileshe A. The legal perspective of corruption by zambia police service, lusaka: university of Zambia, 2009.
9. Chirwa L. An Investigation into corrupt practices involving traffic officers and minibus drivers in lusaka, lusaka: University of Zambia, 2004.
10. Deb K, Nathr K. Vehicle Detection Based on video for traffic surveillance on road. International Journal of Computer Science Emerging Technology, 2012, 121-137.
11. Kaber D, Endsley R. The Effects of Level of Automation and Adaptive Automation on human performance, situation awareness and workload in a dynamic contro task, Marietta: Taylor and francis group, 2003.
12. Kampyongo S. Mounting of Check Points by Security Wings, Lusaka: Parliament Building, 2016.
13. Kharwade P, *et al*. Smartphone application for ticket reservation and validation using mobile network. International journal of emerging technology and advanced Engineering, 2014, 325-327.
14. Lee D, See K. Trust in Automation: Design for apropriate reliance, Lowa city: Human Factors and Egornomics society, 2004.
15. Leoncio A, Camata F. E-Ticketing System. Internatioal Journal of scientific and Technological Research. 2017; 6(12):4-10.
16. Link D, Helingrath B, Ling J. A human-is-the- loop aproach for semi-automated conted moderation, Rio de Janeiro: Long paper-social media studies, 2016.
17. Mala A, Leela N. Automated Fare Collection for public TransportUsing GPS. International Journal of Innovative Research in Science, Engineering and Technology, 2014, 500-303.
18. Manikandan T, kalaiyarasi G, Priyadharshini K, Priyanga R. Conductorless Bus Ticketing System Using RFID and Accident Information through GPS and GSM. International Journal of innovative Science,Engineering and Technology, 2015, 884-893.
19. Mbhuvaneswari, M, *et al*. Embededed System Based Automatic Ticket Vending machine for mordeden Transport System. International Journal of advanced research in Computer and Communication Engineering, 2013, 4251-4255.
20. Mi-Jin K, Yun-Sik Y. Development of real time big data Analysis System. International journal of software engineering and its applications. 2015; 9(7):93-102.
21. Nagalackshmi J, Darsin P. RFID Based railway ticket bookingsystem with mobile based archtecture. international journal of advances in engineering research, 2014, 30-37.
22. Pretrove J, Skourup C. Human in the Loop, Oslo: ABB Review, 2007.
23. Puhe M, Edelmann M, Reichenbach M. Intergrated e-ticketing for public transport and touristic sites, Brussels: Sience and technology options assessment, 2014.
24. Rodriguez C, Lasheras G. Use of role games in Automation assessment, Barcelona: IRIT Press, 2011.
25. Salaimeh A. Information Technologies of the Distributed Applications Design. Leornado Journal of Sciences, 2007, 41-46.
26. Saman M, Haider A. Electronic Court Record management: A case Study. Journal of e-Governance and best Practices, 2012, 1-11.
27. Sato Y, Ito M, Miyateke M. Smartcard Ticketing System for more intelligent railway system, East Japan: Hitachi Review, 2011.
28. Surbanarekha G, Shalini C, Akshay T, Jaisankar N. Android Application for Ticket Booking and Ticketing checking for suburban Railaway. Indian Journal of Science and Technology, 2015, 171-178.
29. Tom H, Isabela G, Mike S. Rigidity in parent child interaction. Journal of arbnormal child psychology. 2004; 32(6):595-607.
30. Uman F, Hidayat R. Web-Based traffic Ticketing Data Processing Information System. Madura, EDP Sciences.
31. Williams C. Research Methods. Journal of Business and Researcch, 2007-2016, 65-72.