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ABSTRACT
In recent years, there has been a paradigm shift in service delivery in government ministries, departments and agencies. Many governments have redefined their service delivery systems through the implementation of e-government using various technologies. This has seen the transfer of major government services to online platforms. The purpose of this study was to appraise the implementation of e-government services using Java technologies by focusing on an e-police management system in Zimbabwe so that Zimbabwe Republic Police (ZRP) can align its systems with other National Police Services world-over. Using a qualitative research method, the researchers collected data from the participants through qualitative questionnaires, semi-structured interviews and focus group discussions. The findings indicated that the majority of services that are offered by the ZRP are not electronically enabled. The study proposes that ZRP can improve its service delivery system by utilising Java technologies presented in this study. This will enable the organisation to solve the problems that are inherent in the current system.

Keywords
E-government services, Java technologies, e-police management system

1. INTRODUCTION
In recent years, there has been a paradigm shift in service delivery in government ministries, departments and agencies. This has been fostered by the introduction of e-government systems around the world. Governments have entered into an intense competition of occupying a leading position in
the e-government arena (Bilbao et al., 2013). Inspired by Denmark and Estonia who have played a leading role in implementing e-government (OECD, 2011), many governments have redefined their service delivery systems by using various technologies to expand their services online (Al-khouri, 2013). Technology plays an important role in transforming government services. It has become a key component in managing and administering public affairs. The use of Information Communication Technology (ICT) have been seen as a catalyst in improving the performance and delivery system of government ministries, departments and agencies (OECD, 2009). ICT has the prospective of supporting governments to bond people, government departments, suppliers and service partners to achieve greater efficiencies and public value. However, OECD (2009) argued that the adoption and use of e-government services remains low and unsatisfactory in other countries, despite the fact that various ICTs that exist in the world of technology have the potential to drive the implementation of e-government.

Using various policies and legislatures, governments world-over have invested heavily in programmes that enable the transfer of major government services to online platforms. Similarly, in Zimbabwe the government directed its ministries, departments and agencies to implement e-government systems in 2013 as enshrined in the ZIMASSET policy document (Government of the Republic of Zimbabwe, 2013). This was aimed at improving public service delivery and sharing of critical information that can enhance efficiency among the arms of the government and its citizens through the use appropriate technologies. The main purpose of this study was to appraise the implementation of e-government services using Java technologies by focusing on an e-police management system in Zimbabwe so that Zimbabwe Republic Police (ZRP) can align its systems with other National Police Services world-over.

While technology has become a key driver for the implementation of e-government globally, there is a non-appearance of explicitly synchronised efforts at government ministries and departments in Zimbabwe to transform government services to e-government (Cunningham and Cunningham, 2008). E-government services in Zimbabwe are characterised by disintegration and discrepancies which has caused inconsistencies in service delivery. Correspondingly, the current ZRP’s service delivery system is yet to provide its major services online. In spite of the fact that some of the internal systems are computerised, electronic delivery of service is yet to be implemented. Furthermore, there are no integrations between ZRP systems with other government departments and agencies whom they are supposed to share with critical data. For instance, the verification of fingerprints
which has to be done with the registrar general’s national database. In addition, vehicle clearance for the purpose of vehicle registration requires verification with ZRP’s database of stolen vehicles. Moreover, applications that could allow the general public to make police reports that do not require the citizen to visit a police station are not implemented. Complainants have to visit police stations to report a crime. The use of electronic forms and Short Message Services (SMS) would be very convenient for the public to conduct such reports in the comfort of their homes. With the scenarios presented above, it can be noted that there is a very huge communication barrier between the police department, citizens, other government departments and agencies in Zimbabwe. Hence, it is important that suitable technologies are used to solve these problems.

The major objective of this study was to provide a methodological guide on improving an e-police management system in Zimbabwe through the application of Java technologies. To achieve this objective, the following sub objectives have been formulated:

a) To analyse the state of e-government services at ZRP
b) To establish services that are electronically enabled at ZRP
c) To identify areas in ZRP’s systems where e-government should be implemented using Java technologies to allow the general public to access police services online.

2. CONCEPT OF ELECTRONIC GOVERNMENT (E-GOVERNMENT)
E-government is characterized by the presence of a two way communication between the government agencies and the citizens, and a total integration of the entire government services for online accessibility (Singh, 2015). It is a system that is implemented using digital means in order to provide a single gateway to various governmental services. Therefore, the aspect of e-government denotes the provision of various governmental services using ICTs, mainly the internet.

Various organisations and authors have provided different definitions on e-government. The World Bank (2012) defines e-government as the use of ICTs such as wide area network, the internet and mobile computing in improving service delivery among citizens, business organisations and other government departments and agencies. As defined by Devasena & Balraj (2014), it is the implementation and delivery of government services through ICTs to achieve efficiency, effectiveness, transparency, accountability and information sharing. Guided by the purpose of the research, this study will define e-government as the transfer of government
services to online platforms using web and mobile technologies to facilitate online and remote access.

2.1. E-government services
Various services exist within the domain of the e-government. Some of the services that signifies the existence of e-government include: e-elections, e-police, and e-healthcare, e-banking, e-tax declarations, e-school, citizen self-service portals, government portals and e-land (Sharma, 2010). However, the success of these services depends on the level of adoption of ICTs among the government ministries, departments and agencies. Therefore, for e-government to be an effective proxy in the provision of government services, it must be implemented using appropriate technologies that support mobility and remote access.

2.2. E-police management system as an e-government service
E-police management system is an integrated platform that uses web and mobile applications to address the operational needs of all units of a National Police Force (NPF). These include crime management, investigations, automated biometric identification, forensic analysis & data exchange within the police force and other government departments and agencies. According to Chavan et al. (2014), an e-police is a government service that uses ICTs brokering systems in increasing the professional efficiency for the government police administration. It is an e-government service that uses ICTs to facilitate communication between the police department and the citizens of a country in order to improve administrative, operational and professional efficiency. Using an e-police management system, police officers can find crime related information from citizens, other police stations and national databases for further action. However, the success of this system will depend upon the development of an interactive website and an electronic database.

3. JAVA TECHNOLOGY
Java consist of various technologies which are subsidiary elements of the three main suites; Java Enterprise Edition (J2EE), Java Standard Edition (J2SE) and Java Mobile Edition (JME). These technologies can support embedded, web, stand alone, distributed and mobile application development. The utilisation of these technologies can allow the development of different types of Java application that can be used in the implementation of e-government services. In this section, the subsidiary elements of Java technologies that are used for web and mobile application development are presented.
3.1. **Java Servlets**

Java Servlets is a Java based web technology used by web developers to create efficient web solutions that are accessed through the request-response programming model. It is the most used Java technology for developing dynamic web pages. Servlets are also known as server side programs because they services the HTTP requests from the client-side, process them and returns back the HTTP responses. They extend the functionality of the server by enabling a connection between the client and the server (Saračević, 2011). They act as a middle layer between requests from web browsers and databases on HTTP servers. This technology enables the server to process multiple requests at once using the threading model; thereby improving performance. According to Qian (2007), the Servlet technology has seen Java expanding greatly in most enterprise web application development. Most enterprise information systems that support web services are developed using the Servlet technology.

3.2. **Java Server Pages (JSP)**

JSP technology function with the combination of HTML and Java in order to provide the dynamic component of the Web. It enables programmers to mix regular and static pages with dynamically generated content using special tags (Bergsten, 2002). The elements of the JSP technology determines how the page builds dynamic content. Like the servlets, JSP enables users to interact with the databases and web services, and also process responses according to client request. The technology is also platform and server independent because it can run on different operating systems or web servers. While there are various technologies that are used to build web applications that serve dynamic content, JSP has really caught the attention of the web development community (Koletzke, Dorsey & Faderman, 2003). The process of creating JSP accessible on the web is much simpler than other web development technologies because it does not require packaging of the program.

3.3. **Enterprise Java Beans (EJB)**

EJB technology addresses the need to support distributed, transactional, secure and portable applications based on Java technology (Kumaran, 2002). It is a framework for the server-side of enterprise Java applications that support database driven websites. The use of EJB in developing web applications makes Java a distributed technology which can be accessed from different servers and platforms. This technology support database programming by providing services like transaction management and persistence management (Stevens, 2010). The technology was developed for the purpose of reducing repetitive work involved in persistence,
transaction management and database security. As opposed to servlets, the EJB is a pure business component that support load balancing, clustering, resource pooling and caching (Dolgicer et al., 2003).

3.4. Java Data Base Connectivity (JDBC) API
The JDBC API defines interfaces and classes for writing database applications in Java. JDBC provides a standard library for connecting to relational databases using Structured Query Language (SQL) with exactly the same Java syntax. However, for the connection to be established the java application must call the JDBC library so that it loads the driver that provides a link to the database (Manonaniam, 2000). It can be used in servlet, JSP or EJB technologies to access the database when implementing database driven websites. Therefore, the main function of JDBC is to establish connections to databases, provide access to a given database, provides mechanisms for reading, inserting, updating and deleting entries of data in a database and takes care of transactions composed of different SQL statements (Stevens, 2010).

3.5. Mobility Pack
Mobile applications are created for mobile use through Java technology. The applications can run on devices like cellular phones, tablets, PDAs and palmtops to mention but a few. Java has a dual role in the development of mobile applications. First, the application should support the sending and receiving of SMS, whether single or bulk between two ends or devices. Secondly, it should support the development of applications that are compatible with mobile devices that uses different operating systems. The two roles of Java in mobile application development can be implemented using mobility pack. This is a Java API that enables software developers to integrate SMS technology into their solutions and helps them develop platform independent applications suitable for mobile devices (El-Kassas et al., 2015).

4. METHODOLOGY
A qualitative research method based on qualitative questionnaires and semi-structured interviews were conducted to ascertain whether ZRP is providing some of its services online to the general public. These research instruments also helped the researchers to identify areas of application for Java technology in implementing an e-police management system. Focus group discussion was used to critical evaluate the methodological guide for the use of Java technologies in improving an e-police management system in Zimbabwe. The participants for completing the qualitative questionnaire were randomly selected from the general public. Although the selection for
questionnaire was random, the participants were supposed to have reported a case before. This helped the researchers to establish the state of the e-government services at ZRP. As for the semi-structured interviews, participants were selected using a stratified sampling technique from all the operational units of ZRP at the 2015 Provincial Agricultural show. According Hair et al. (2015), this sampling technique enables the researcher to achieve a proportional representation from the study population. The sample population for focus group discussions was composed of 12 certified Java programmers from Zimbabwe.

5. FINDINGS
This section presents the findings of the study based on the information gathered from the police officers and the citizens of Zimbabwe.

5.1. The state of e-government at ZRP
In this subsection, the state of e-government at ZRP is presented in view of the services offered through web or mobile technologies.

5.1.1. Citizens using web or mobile technology to report crime
In this category, all the respondents indicated that there is no website at ZRP that allows crimes to be reported using this facility. Crimes are reported physical at the police station or by calling the police station. The mobile technology is limited to phone calls only. Although phone calls are part of the facility to report a crime, it was noted that in some instances the line(s) may be continuously engaged or some police officers are not willing to record crime reports from phone calls.

5.1.2. Citizens using web or mobile technology to send suggestions
There are no electronic suggestion boxes at ZRP stations in Zimbabwe. All the respondents indicated that they are only able to send suggestions to the police using WhatsApp platforms. Each police station has a WhatsApp number that can be used by the citizens to send suggestions and tip offs.

5.1.3. Citizens using web or mobile technology to track progress on their reports
The citizens are not able to use web or mobile technologies to track the progress of their reports. They are supposed to visit the police station where the case was reported.

5.1.4. Citizens accessing notices via the web or mobile technology
Notices that include policies and procedures that support law enforcement are not accessible by either web or mobile technology. In most cases, citizens are caught by surprise by the law enforcement agents.

5.1.5. Police officers using web or mobile technology to clear vehicles and finger prints
Clearances for vehicle and finger prints are done manually. The details of the vehicle or the person to be cleared are captured at the police station and sent through manual dispatches to the Head Office which has the central database. The officers at the Head Office verify the records as per clearance required. In turn, the clearing officer action the clearance documents accordingly and send them back to the dispatching office using the same delivery channel.

5.1.6. Police officers using web or mobile technology to verify driver’s licences
Verification of drivers licences for possession and genuine has been a major challenge since it is enforced at roadblocks which is some distance away from the police station. In most cases, motorist are delayed at the roadblocks for failure to produce a driver’s licence or for being suspected to be holding a fake driver’s licence. This is because police officers at the road block do not have the facility to conduct instant verification. The motorist has to be taken to the police station or have the vehicle impounded until the driver’s licence has been produced or verified with Central Vehicle Registry to be genuine through a phone call.

5.2. Services that are electronically enabled at ZRP
The success of an e-government service depends on the number of services that are electronically enabled. The findings of this study noted that the majority of services that are offered by the ZRP are not electronically enabled. Citizens need to visit or call the department in order to access a service. It was found that the only service that is electronically enabled is crime reporting through WhatsApp platform. Each police station has a WhatsApp number that can be used by the citizens to report crime or give suggestions.

6. APPLICATION AREAS OF JAVA TECHNOLOGY FOR E-POLICE MANAGEMENT SYSTEM
Java technologies can be utilised in different areas of e-government and for various e-government applications that can be implemented by ZRP. To ensure that an e-police management system is implemented in Zimbabwe, in
this section areas of application for e-police management system where java technologies can be used are identified and explained.

6.1. **E-crime reporting**
This service is expected to provide online crime reporting to citizens using web or mobile technologies. Any citizen who is a victim of crime can send a report to the nearest police station by completing a web form or using a predefined format for SMS. The web forms may be developed using JSP or servlet while an SMS gateway may be developed using Java eclipse with auto-response functionality for sending delivery reports to the crime reporter. For the crimes to be routed to specific tables, JDBC API can be utilised to handle the INSERT query to the crime management database.

6.2. **E-suggestion**
This service will allow citizens to send their suggestions that can assist the police officers in tracking criminals and detecting crime. An electronic suggestion box need to be implemented using JSP and JDBC API. JSP is necessary for developing web forms for inputting suggestions while JDBC is needed for allowing the insertion of suggestions to the electronic suggestion box and retrieving them for further analysis. The major SQL statements for this service are the INSERT and SELECT.

6.3. **E-clearance**
This service will provide a linkage between the police department and government departments that has the central databases for vehicle and fingerprints. There is need for system integration especially between ZRP's Stolen Motor Vehicle Database and CVR's vehicle registration system to allow verification of vehicle before registration by CVR. In addition, integration is needed between ZRP’s Fingerprint Identification System (FIS) and National Registration System to allow verification of accused identity before creation a criminal record of same by ZRP. The JDBC and the EJB API can be used in this service since the two APIs are used to provide connection among relational databases and handling database transactions respectively. This linkage will unlock government-to-government e-government.

6.4. **E-crime progress tracking**
This service will allow complainants and the police officers In-Charge of crime investigations at various stations to check the productivity of the investigating officers using web technologies and the intranet respectively. To implement this service, JSP will be required for creating the login function while in turn JDBC will handle database queries.
6.5. **E-notices**
This service will enable the police to transfer policies and procedures to the online platform, giving easy access of information to citizens instead of placing policies and procedures on notice boards at the charge office. Other critical notices may include the names of criminals on the wanted list, warrant of arrests, missing persons, people detained at police stations, lost and found property and victims of road accidents. This service can be implemented using JSP or Java Servlet to provide dynamic web content. Apart from putting notices on the website, crime alerts can also be executed as SMS using Ozeki Message Server and JDBC, whereby the SELECT statement written in Java will be used to query the database table for outgoing messages to the citizens.

6.6. **E-driver’s license verification**
This service will enable the police officers at the roadblock to verify the existence of a driver’s license from CVR using mobile technology while those at the police station may use web technology. To implement the mobile functionality, a powerful SMS solution can be developed with an auto reply facility. This can be done using an SMS gateway created in Java eclipse, database triggers or stored procedures enforced using JDBC while supported by the INSERT and the SELECT statements.

6.7. **E-payment**
The presence of this service to the e-police management system is expected to allow citizens to pay for services and fines that are administered by ZRP using available electronic or mobile payment systems in Zimbabwe. For example, fingerprint vetting and road traffic offenses. In this regard, the JSP is needed for developing form based and API based gateways to provide authentication, authorisation and integration. The other technologies for this service include the mobility pack which enables the development of applications for mobile devices and the JDBC for handling payment records of services and fines.

7. **FURTHER RESEARCH**
The study looked at the basic and core business of the police force in Zimbabwe. In order to fully utilise an e-police management system, there is need to incorporate the aspect of intelligent system in order to increase crime control. Furthermore, future research may also look at how the technology may be used to handle the administrative needs of the police force. For example, e-procurement and e-transfers of police officers.
8. CONCLUSION
Java technologies have come a long way in developing mobile and web technologies. Most applications that are needed to allow online service delivery can be developed using Java. The use of Java technologies for the implementation of e-police management system by ZRP is expected to improve the quality of services, reduce the costs of delivering services, improve the utilisation of scarce resources, enhance accountability and transparency and restore citizen confidence in government services. This study noted that there are a number of services ZRP can provide online to Zimbabwe citizens and its officers. For the aforesaid reason, ZRP need to implement e-government system to conform to other National Police Services world-over. Hence, this study suggested a methodological guide of providing an e-police management system anchored in a web portal developed using Java technologies that are capable of supporting the core business of the police force in Zimbabwe.

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10. REFERENCES
Bergsten, H., 2002. JavaServer Pages,
Chavan, R. et al., Securing Information Brokering In Distributed Information Sharing Using RC6 and SPEKE. , 2(2).


This paper may be cited as: