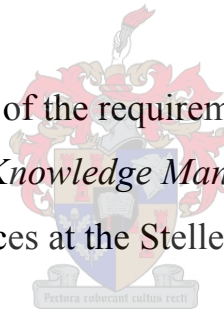


Evaluating the Effectiveness of the Vehicle Registration & Licensing System of Botswana's Ministry of Transport and Communication Using the Delone & McLean Model

By

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Thesis presented in fulfillment of the requirements for the degree of *Master of Philosophy (Information and Knowledge Management)* in the Faculty of Arts and Social Sciences at the Stellenbosch University



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March 2015

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Opsomming

Inligtingstelselsuksesevaluering is 'n konsep wat baie organisasies nou al vir dekades interesseer. Die motivering hiervoor is hoofsaaklik geleë in finansiële redes. Organisasies wil hiermee vasstel of dit 'n goeie besigheidsbesluit was. Hierdie vraag word dan dikwels beantwoord deur die verkryging van direkte en indirekte voordele deur gebruik te maak van so 'n stelsel.

Soos baie organisasies het die regering van Botswana miljoene pula belê in die implementering van inligtingstelsels in verskeie staatsdepartemente. Die Voertuigregistrasie en Lisensiestelsel is 'n voorbeeld hiervan wat deur die Departement van Padvervoer en -Veiligheid van die Ministerie van Werke, Vervoer en Kommunikasie ontplooi is.

Geen formele wetenskaplike navorsing is geloods na afloop van die implementering van die stelsel nie, veral nie sedert die gebruik deur motoriste nie.

Hierdie studie poog juis om die effektiwiteit van die stelsel te meet, veral vanuit die verbruiker se perspektief.

Die Delone en Mclean Inligtingstelsevalueringmodel word gebruik om die hipotese van die navorsing te toets. 'n Gestruktureerde vraelys is opgestel om data te versamel. Die SPSS as 'n algemene navorsingsinstrument is gebruik vir analise, asook vir kruistabulasie en chi-kwadraattoetse.

Die bevindinge van die studie sal die korpus van kennis van inligtingstelselsuksesevaluering verryk ten opsigte van die sleutelfaktore wat kan bydra tot die sukses of nie-sukses van inligtingstelselimplementering.

Verdere studie in hierdie betrokke gebied word deur die navorsing gestimuleer, om veral die effektiwiteit van Inligtingstelselbeleggings te bepaal.

Abstract

Information System Success Evaluation has been a concept of interest to many organizations for decades now. The main motivation for this activity is usually from the financial view of things, that is, the main interest of an organization carrying out IS success evaluation is mainly to find out whether investing in such a system was a good business decision. This question is often answered by the realization of the direct and indirect benefits realized by deployment of using such a system.

Like many organizations the government of Botswana has invested millions of Pula's in the past number of years in acquiring and implementing different Information Systems in the various Ministries and Departments. One such system is the Vehicle Registration and Licensing System, which was deployed by the Department of Roads Transport and Safety of the Ministry of Works, Transport and Communication. After the VRLS implementation there has not been any formal scientific research or investigation conducted to find out the success of this Information System, especially with regards to the stakeholders who use this system for their daily jobs.

This study therefore engaged in a task, which evaluated the success of the Vehicle Registration and Licensing System and answered the question of how effective the system is from the user's point of view. A well-known Information System success evaluation model, known as the Delone and McLean IS evaluation model, was applied to test the hypothesis of this research. A structured questionnaire was used to collect the research data. The results were analyzed using a common research tool, the SPSS, including cross tabulation and chi-square tests.

The findings of this study will further enrich the IS success evaluation Body of Knowledge on the key factors which can contribute to a successful or unsuccessful Information System acquisition investment. Furthermore, the researchers who will further look into this subject may find these findings very useful and also stimulating to do further research on this subject to unveil further evidence of the ingredients of an effective Information System investment which has been accepted by and accredited by its users.

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The last three years of my life I dreamt of the moment I will write these lines. To once and for all get rid of this burden.

Thank you to my loving husband John and daughter Atsile for allowing me to commit time and a lot of effort to conducting this research, to the gentlemen I drew a lot from their experience in conducting research: Godfrey Mlambo and Edwin Amanze, to more importantly my incredible supervisor Mr. Dewald Blaauw and to even most importantly our Father in Heaven for giving me the necessary strength and courage when I needed them the most.

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Abbreviations

BDF: Botswana Defense Force

BL: Bechuanaland

BLP: Bechuanaland Protectorate

CID: Criminal Investigation Department

CTO: Central Transport Office

DRTS: Department of Roads Transport and Safety

GVM: Gross Vehicle Mass.

ICT: Information & Communication Technology

ID: Identity Card

IS: Information System

IT: Information Technology

MTC: Ministry of Transport and Communications

PMS: Performance Management System

RV1: Vehicle Registration

VRLS: Vehicle Registration and Licensing Information System

Chapter 1

Points of Departure

1 Introduction

Limited empirical research has been reported on the evaluation of both intra- and inter-organizational Information Systems (IS) and not much has been published to educate on the difficulties and failures of IS with regards to user satisfaction and acceptance¹. There are many different definitions of what IS are but a general description relays IS as computer-based systems providing organizations with information support². IS serves organizations with reliable organizational data. Since IS reduce and filter the amount of organizational data and transform it into useful information that is more accessible, IS are used to ease the decision making process within organizations³.

Information Systems (IS) now represent extensive financial investment for many organizations and governments. Botswana government has not been exempted from this trend of events. As part and parcel of Botswana's e-government strategy outlined in the National – Government Strategy⁴, the research cites *“Botswana is already an active participant in the Global Information Society. Guided by our National ICT Policy, Maitlamo, we have witnessed a number of major advancements in terms of our domestic connectivity and use of modern day technologies. As a nation, we have invested heavily in our national ICT infrastructure”*.

¹ Irani Z (2002) Information systems evaluation: Navigating through the problem domain, 12

² Ives Hamilton G B (1980) A framework for Research in computer-based Management Information Systems, 910-934

³ Senn, J.A. (1978) Essential Principles of Information Systems Development, 17-26

⁴ The Botswana's National e-Government Strategy 2011-2016, 6

Information Systems and Technology (IS/IT) managers have found it increasingly difficult to justify rising IS/IT expenditures⁵, and are often under immense pressure to find a way to measure the contribution of their organizations' IS/IT investments to business performance, as well as to find reliable ways to ensure that their organizations' IS/IT investments are actually realized⁶.

Furthermore, the evaluation of these IS/IT investments is a complex tangle of financial, organizational, social, procedural and technical threads, many of which are currently either avoided or dealt with ineffectively⁷. As a result, many organizations opt to ignore the evaluation process on their information systems, especially after implementation, as many assume that since the investment has already been made, the process might be pointless. This problem has become more complex as the nature of IS/IT investments and the benefits they can deliver has changed rapidly⁸.

Using traditional financial measures to assess IS success has proven to be insufficient because of the complex nature of IS; hence, researchers within this field shifted their focus towards the use of qualitative measures to assess IS success^{9 10}. Researchers developed the concept of IS success and managed to categorize IS success measures from previous research into IS success dimensions¹¹.

As already expressed, the government of Botswana has invested substantial resources in realizing its ICT policy strategies and one amongst such is the implementation of the Vehicle

⁵ Silk D J. 1990. *Managing IS benefits for the 1990s*, 185-193

⁶ Singh S K. 1993. *Using information technology effectively*, 133-146

⁷ Mirtidis D, Serafeimidis V. 1994. Evaluating Information Technology Investments In Greece, 167-177

⁸ Willcocks L. 1992. Evaluating Information Technology Investments, 243-268

⁹ Symons, V. (1991). A review of information systems evaluation: content, context and process, 205-212

¹⁰ Rubin, H. (2004). Into the light

¹¹ Sedera, D. & Gable, G. (2004). A Factor and Structural Equation Analysis of the Enterprise Systems Success Measurement Model, 449-464.

Registration and Licensing System (VRLS). The VRLS was designed to centralize and simplify the information asymmetry process as well as benefit both the user and end user through shortened processing times and waiting times. Therefore the researcher has decided to assess the VRLS's efficiency and effectiveness by adopting a scientific approach of using an IS success evaluation model.

The research has noted the existence of several information system (IS) evaluation models namely; the Delone & McLean's model of Information System Success Model (ISS), the Technology Acceptance Model (TAM), Integrated Model of User Satisfaction and Technology Acceptance (IUSTA), Integrated Research Model (IR), Unified Theory Of Acceptance And Use Of Technology Model (UTAUT), Theory of Planned Behavior Model (TPB), Theory of Reasoned Action Model (TRA), Decomposed Theory Planned Behavior (DTPB), Management Technology Acceptance (MTA) and finally the ISA MODEL to mention a few amongst many.

The research will compare different IS success models in order to justify the selection of an appropriate IS evaluation model. The selected model shall provide the researcher with dimensions that can be used to evaluate the effectiveness of the VRLS with regard to user overall satisfaction and acceptance of this system.

User acceptance and satisfaction is a huge pivotal factor in determining the success or failure of an information system¹² in organizations. User satisfaction and acceptance align to an Information System's functionality and usefulness to achieve an assigned task, therefore it becomes necessary to determine the user's perception of whether the technology embedded within the Information System is convenient and user friendly.

To the best of the researcher's knowledge, verified by consultation with the DRTS, no such evaluation research has been conducted before, in particular on the VRLS. The researcher hopes this investigative study will reveal vital information that will be added to the existing body of knowledge on Information System evaluation. Furthermore research findings shall be

¹² Davis D.F. 1993. *User acceptance of information technology*, 475

a source of valuable information for the DRTS to use for informed decision-making concerning the utilization, maintenance and management of VRLS.

2 Background Information

The Department of Road Transport and Safety (DRTS) is a Botswana government department within the Ministry of Works, Transport and Communication¹³. DRTS, being one of the six (6) Departments within this Ministry, owes its existence to the reorganization of the Ministry back in the 1970's¹⁴. Since its establishment in 1989, the Department has continually increased its outreach and service delivery system in order to enhance public access to its services and reduce the customers' traveling time and costs¹⁵.

The Department currently has a computer network of 28 offices, and has established links with around 14 postal offices which include Poso House, University of Botswana, River Walk, Orapa, Tatitown, Masunga, Kanye, Hukuntsi, Maun, Mochudi, Serowe and Botshabelo in Francistown¹⁶. These post offices offer service in the form of renewal of motor vehicle licenses only. The DRTS responsibilities are clearly detailed as given in Appendix 8.

2.1 Monitoring of Botswana vehicle population

Prior to the existence of the VRLS system, the DRTS did not have an automated system that could be used to account for the country's vehicle population, tracking and effecting vehicle ownership changes, collection of fines and other surcharges due. If ever the system was there then it was a manual system so 'infested' with storage issues, redundancy of data, huge bureaucratic processes that could disadvantage the client and even the owners of the system.

¹³ Botswana Innovation Hub. (2009) Government Portal

¹⁴ Botswana Innovation Hub. (2009)

¹⁵ Botswana Innovation Hub, (2009)

¹⁶ Botswana Innovation Hub. (2009)

In the process of employing the manual vehicle registration and license renewal system, the DRTS noted a number of challenges as indicated in the department's records¹⁷. The main limitation of this process was the restrictive process used to allocate vehicle registration number plates. Initially, before 1979 the number plates used the format which started with 'BP' followed by three digits combination of different numbers. This method could only cater for a maximum of one thousand vehicles for the whole country and this worked fine for only a short time.

However due to population increase and growth of the Botswana economy the population of cars also increased and the system for number plates was outlived. In the era of the second system the plate numbers consisted of three alphabets starting with BL and the third one had to be the letter representing each of the five Districts in the country, plus three number digits.

This allowed for each district to be allocated a thousand numbers, which meant a total of five thousand country-wide. Nevertheless, it also faced the same fate as the former system. Thus the process of vehicle registration became awfully cluttered and without doubt needed an automation tool. The DRTS embarked on a strategy to implement an IS that could automate the vehicle registration and licensing.

The VRLS' main business concern was to keep accurate records of car owners, change of ownership, allocation of vehicle registration and synchronization with each ownership event. Key information kept per vehicle entry includes, but is not limited to; vehicle color, registration number, body type, engine number, chassis number, date of ownership and change of ownership, addresses of owner, vehicle weight (unladen and gross). The entire process of vehicle registration and vehicle license renewal followed and their requirements are given in appendix 1-7.

In addition to supporting all these business functions, the VRLS is responsible for managing the financial transactions of the other systems used by the DRTS and allocate their votes

¹⁷ DRTS Records (1995-2012)

accordingly¹⁸. It produces financial documentations e.g. Receipts, pay-in document, remittance document and performs all the reconciliation of the accounts of the department.

2.2 VRLS Maintenance and Evolution

The Information Technology (IT) department at DRTS is tasked with the responsibility of monitoring the performance of the VRLS as well as managing the Change Request process on system expansion and maintenance. These requests are escalated by system users or as technical faults recorded¹⁹. This according to the DRTS is a way of ensuring that user satisfaction is sustained through implementing their requests.

DRTS has outsourced the system maintenance task to an undisclosed local IT consulting company²⁰. Once the Change Request has been assessed and approved, the IT Department contacts the on-sight consultants who will then take care of the development of the required change. After developments are made the IT department has to test them and accept if satisfied, after which the program will be moved to Production. Since its implementation, the VRLS has continually evolved, and each time any changes are made on it, be it of system customization, modification or improvement the System Development Life Cycle steps were observed²¹.

3 The research problem

The DRTS management expresses the opinion that although no proper and formal evaluation of the VRLS has been performed using an appropriate scientific research tool, the system so far has performed satisfactorily. The management assures that the department performs

¹⁸ DRTS Records (1995-2012)

¹⁹ DRTS Records (1995-2012)

²⁰ DRTS Records (1995-2012)

²¹ DRTS Records (1995-2012)

yearly audits, which include auditing the maintenance and Change Request process handled by the consultant company, which helps to enforce quality assurance²².

Quite notable in the whole scenario is the absence of enough concern for the views of the main system users; that is, the front-desk officers, with regard to their acceptance and satisfaction with the VRLS. Lack of user acceptance and satisfaction is a significant impediment to the success of new information systems²³.

Often the technical or support department can make assumptions that since the system has got certain highly valued functions and specifications, therefore its performance and utilization is high. This could be contrary to the systems users' point of view, which can be influenced by different perceptions, beliefs and attitudes in utilizing the system. These influences indeed have a serious impact on the system's effectiveness in realizing intended tasks in an organization.

The research problem that this study shall tackle is to evaluate the front-desk officers' point of view as to whether the deployment and utilization of VRLS at DRTS is a success or not. This shall in turn bear on decision-making regarding the effectiveness and efficiency of this system.

4 Aims and objectives

4.1 Aims

The main aim of this research is to evaluate the effectiveness of the VRLS at the DRTS, in relation to user acceptance and satisfaction. This will aid to find out whether the deployment, support and utilization of the system have contributed to better operational capacity and motivation among its main users.

²² DRTS Records (1995-2012)

²³ Gould Boies & Lewis (1991) Making usable, useful, productivity-enhancing computer applications, 74-85

4.2 Objectives

The specific objectives stemming from these general aims are as follows:

- To investigate the level of user satisfaction in utilizing the VRLS.
- To find out the users' views with regards to the VRLS system quality, service quality and information quality.
- To examine whether the user has realized any net benefits in using the VRLS.
- To determine whether the VRLS as an information system is a success from the front desk officers' point of view.

5 Research questions

The following research questions shall guide this dissertation;

- Are the front-desk officers generally satisfied with the VRLS?
- Does the user's satisfaction with the VRLS at DRTS play a role in its utilization hence instigating a higher service delivery to the general public?
- Has the technology embedded in VRLS facilitated user acceptance and satisfaction?
- To what extent has the VRLS support at DRTS ensured continuous user acceptance and satisfaction?
- Overall what is the impact of the VRLS at DRTS on utilization, productivity, and profitability of this department?

6 Significance of the study

This research study is expected to provide important information on the correlation between VRLS user satisfaction and acceptance, which has an implication on effective and efficient service delivery. The study is expected to unearth the link between the provision of system support, system user acceptance and satisfaction.

Since system user satisfaction, acceptance and system support have been identified to be critical factors that have an impact on the VRLS delivery efficiency and effectiveness, the

discovery of a correlation or lack of correlation between these aspects may be used to guide management information system developers and their clients to devise other methods that can contribute to better user satisfaction and acceptance, thus contributing more to organizational productivity, employee morale and improved profits.

This study shall also go a long way to find the best ways that can be used to identify possible solutions and mitigating factors that can be used to enhance user system satisfaction and acceptance so as to improve their user motivational potential and productivity.

Lastly the study shall seek to provide insight into how user system acceptance and satisfaction can enhance productivity and profitability for the organization. This study shall seek to make a contribution to the body of knowledge on the effect of these two critical factors. This study shall provide knowledge to augment existing studies. User system satisfaction and acceptance can be positively influenced by this study.

7 Assumptions of the study

System user satisfaction is a key and vital ingredient in ensuring successful deployment and utilization of any management information system in any organization. Coupled to this phenomenon is the system acceptance by the same user, which confirms that the system is indeed capable and able to perform better than the predecessor process.

It is with this supposition, that the key component of an Information System is the user who should be satisfied and furthermore be encouraged to accept the technology. Given this scenario it can be said that the system has been successfully deployed and is being utilized to the highest level, thus efficiency and effectiveness is realized.

8 Delimitations

The study shall be done on the VRLS users from different parts of the country that interact with the system on a daily basis in dealing with customer issues. Although it shall focus only on a smaller part of employees in the government of Botswana, its findings may help to focus future macro studies designed to study a larger population. Time constraints and the limited scope of the study justify the delimitation.

8.1 Limitations

This study is likely to have the following limitations;

- Due to the financial and time constraint, the researcher will not be able to cover all the DRTS offices spread around the country, in terms of distributing questionnaires to each of them, thus the study will only focus on Gaborone and nearby places.
- International students' access to the university library facilities and resources was a challenge because of some technical issues the library experienced at times.

9 Key Terms and Definitions

Information Technology (IT): It is the utilization and applications of computers and telecommunications equipment to store, retrieve, transmit and manipulate data²⁴.

Information Systems (IS): It is a collection of computer networks, computer hardware and software that people and organizations use to collect, process, create, and distribute information for business purposes²⁵.

Ministry of Transport and Communication (MTC): A ministry in the government of Botswana mandated with the sole goal of ensuring that the country's transport system is managed, planned, monitored and accounted for in terms of development and maintenance. The other goal implied is the communication, which encompasses ICT, and it's harnessing within other government departments and countrywide.

Department of Roads Transport and Safety (DRTS): It is a department within the MTC and specially assigned to deal with roads and transport in Botswana. This entails motor vehicle registration and accountability, safety and roads construction and maintenance.

²⁴ Mann J. (2000) IT Education's Failure to Deliver Successful Information Systems: Now is the time to address the IT-User Gap, 254-267

²⁵ Lally G. (2004) Understanding Information Technology System Project Failure

Vehicle Registration and Licensing information System (VRLS): Is an information System used by the DRTS to manage, plan, monitor and impose charges and fines for all motor vehicles in Botswana.

Omang: It is a national registration document used in Botswana for purposes of individual identification and it bears a unique number to identify an individual.

Identity Card (ID): It's a document used to identify and authenticate individuals.

Criminal Investigation Department (CID): It is a department under the Botswana Police, which is accountable for investigating and divulging criminal activities committed by all residents and non-residents in Botswana with the intention of maintaining law and order in the country.

Botswana Defense Forces (BDF): The armed forces in Botswana that are mandated with ensuring the country's security, protection and defense from invasion or aggression accomplished.

Central Transport Office (CTO): Government of Botswana department tasked with procuring, registering, disposing and maintaining all government motor vehicles.

10 Chapter Organization

The thesis emanating from this study will be structured into chapters as follows;

Chapter 1 presents the introduction and problem setting. It deals with the definitions of key terms and the motivation and purpose of the research, which is to determine the efficiency of the VRLS by determining user satisfaction and acceptance of this system. It also contains the background to the thesis, the research problem and purpose of the study. Objectives of the study, assumptions, limitations and delimitation are also explained in this chapter.

Chapter 2 shall provide a review of the literature related to defining and explaining the concept of information system development, information system life cycle and categories of information systems. The chapter shall also discuss the different IS stakeholders and their importance to information systems and their success evaluation.

Chapter 3 will dwell on IS success and IS evaluation. The chapter will further dwell on information system evaluation parameters that affect system users in working with information systems such as user acceptance and satisfaction. Various information system evaluation models shall be reviewed and the research shall select an appropriate model based on merits and demerits. Furthermore the chapter shall discuss the determined information system evaluation model adopted by the research and its relevancy to successfully evaluate the VRLS efficiency.

Chapter 4 shall describe the research methodology, design and data collection methods. The tools of the research shall be identified and described. The research approach shall be described in this chapter. Data sources shall also be described in this chapter. Sampling approaches shall also be described in the chapter, together with issues of validity and reliability to be attended to. Participants, procedures and ethical considerations shall also be clarified in the chapter.

Chapter 5 shall deal with the study findings and their interpretation. It shall give the findings from the field work using the methodologies, participants, tools, approaches and procedures described and explained in chapter 4. Findings shall be tabulated and classified in order to find the how these factors interact. Findings from evaluating the VRLS system based on the defined model will assist to determine the level of system use, user satisfaction, net benefits, system quality and service quality of the VRLS.

In chapter 6 the results found in chapter 5 shall be summarized and used to determine the significance of the trends discovered. Conclusions shall be reached and recommendations shall be given on the basis of the conclusions reached.

Chapter 2

Information Systems

1 Introduction

This chapter shall provide a review of the literature on information systems consulted for this study. The chapter shall deal with the expected role of Information Systems (IS) in an organization and the different types of IS. Many types of IS exist; this chapter shall attempt to differentiate them and explain their functions in an organization, as well as their applications at different hierarchical functional levels of the organizations.

The research shall touch on IS development theories and roles played by IS developers and users in developing an IS that is applicable and appropriate for a given organizational problem. An exploration shall be done to determine the influence and roles that these stakeholders play in ensuring that the IS being developed would serve their needs in accomplishing job tasks in an organization. The chapter intends to relate how these stakeholders affect the design and development of IS and hence highlight the link between expected performance and delivery of the IS. Logically this gives a bearing to a higher user system utilization, acceptance and satisfaction.

2 Information Systems

IS can be defined as a set of interrelated and interacting elements or components that collect, store, process, and report data and information that can be used to enhance the process of decision making²⁶. Another definition regards IS as an Information Technology (IT) tool that provides accurate, reliable, and timely information²⁷.

The term information systems is also used to describe an organizational function that applies IS knowledge in industry, government agencies and not-for-profit organizations. A summary

²⁶ Al-Adaileh R. (2008) Essentials of Management Information Systems, 227

²⁷ Elpez & Fink (2006) Information System Success in the Public Sector, 219

of Information System (IS) definitions from the few given regards it as a modern system which is based on Information Technology (IT) and the system removes tedious documental work and optimizes the configuration of information and manpower resources.

An Information System has three critical elements which are Information Technology, people's activities using that technology to support organizational business operations and the organization itself. To some extent, the term information system is frequently used to refer to the interaction between people, algorithmic processes, data and technology²⁸. In this sense, the term is used to refer not only to the information and communication technology an organization uses, but also to the way in which people interact with this technology and also the level of their contention, satisfaction and acceptance to utilize the system in support of organizational business processes²⁹.

Irani further advocates that Information systems make it possible to improve organizational efficiency and effectiveness, which can provide competitive advantage³⁰. The importance of developing a robust and responsive Information Technology and Information System infrastructure to support the formal planning and control of business processes is increasing in importance³¹. In support of this, Weill and Broadbent draws attention to the care needed during the evaluation and management of technology-based resources³².

3 The role of information systems in organizations

Data is often referred to as the ‘blood of an organization’ because its supply enables organizations to make informed decisions, plan for the future, learn from the past and be aware of the trend of business processes for any periodic or seasonal time and many other things. In any organization, data serve as the most basic element for all decision making. Normally, useful data in the context of organization are selected and stored in the data repository.

²⁸ Zontul Kaynar & Kirgul (2005) English preparatory program information system, 105

²⁹ Zontul Kaynar & Kirgul (2005), 105

³⁰ Irani (2002), 11

³¹ Irani (2002), 12

³² Weil & Broadbent (1998)

Information Systems are very much concerned with data gathering, storing, processing to information and distributing the information in conjunction with associated technologies to the society and organizations. Thus information systems include people, procedures, data, software, and hardware that are used to gather and analyse digital information. People from their acquired knowledge, intelligence and wisdom use this information for taking some appropriate action.

Different organizations and individuals in contemporary society rely on information systems to manage their operations, compete in the marketplace, supply services, and enhance personal lives. For instance, it is very evident that modern corporations depend on computerized Information Systems to process financial accounts and manage human resources; municipal governments depend on Information Systems to provide basic services to its citizens; and individuals use information systems for their studies, shopping, banking, and investment.

It is from this fervent hope that the government of Botswana has embraced the VRLS as a key tool for data collection and management of all vehicles in Botswana. The government has recognized the role and importance of IS in enhancing the effectiveness and efficient management of motor vehicles in Botswana. The largest growth in most economies is coming from 'information' industries. The success of such knowledge-based organisations lies in implementing and utilization of IS. In addition, noted trends in technological change and globalisation of markets have witnessed many organizations placing an increased emphasis on implementation and utilization of IS.

4 Categories of information systems

From the IS definitions presented above it is evident that IS are basically concerned with the processing of data into information, which is then communicated to the various departments in an organization for appropriate decision-making. Because there are various decision making levels, there exist different types of IS to serve these levels in line with the various functional levels of an organization.

There are three levels of decision making in an organization namely tactical, strategical and operational. Operational decision-making deals with the day-to-day decisions such as ordering in more stock etc. Tactical decision-making deals with short to medium term periods and typical concern issues such as introducing a new product to a particular retail outlet. Finally strategic decision-making considers high risks and has a long-term effect, for instance, whether to open a new branch, or take over a rival concern.

Cornford & Shaikh³³ mentions the various IS types exist based on the different hierarchical functional levels in an organization. Some examples of such systems are Data Warehouse, Enterprise Resource Planning, Enterprise Systems, Expert Systems, Geographic Information System, Global Information System and Office Automation, Transaction Processing System (TPS), Management Information System (MIS), Decision Support System (DSS), Executive Information System (EIS), Expert System (ES), Office Automation System (OAS) and Business Expert System (BES). A brief description of each system is outlined below and the level at which it is applicable.

4.1 Management Information System (MIS)

A Management Information System is an integrated set of components or entities that interact to achieve a particular function, objective or goal³⁴. Therefore it is a computer based system that provides information for decision making on planning, organizing and controlling the functioning of the sub-system of the firm and provides a synergistic organization in the process.

4.2 Transaction Processing System (TPS)

A Transaction processing system is an information system that manipulates data from business transactions³⁵. Transactions include events such as sales, deposits, purchases,

³³ Cornford and Shaikh (2013) Introduction to Information Systems, 67-72

³⁴ Cornford & Shaikh (2013), 70

³⁵ Cornford & Shaikh (2013), 69

withdrawals, refunds and payments. The TPS records and processes the data that result from business transactions such as sales, purchases and inventory changes. Transaction Processing Systems also produce a variety of information products for internal or external use. For example TPS produces customer statements, employee pay cheques, sales receipts, purchase orders, dividend cheques, tax forms and financial statements.

4.3 Decision Support System (DSS)

A Decision Support System (DSS) is defined as an IS application program that assists the managers in the decision making process which includes planning and analysing activities, thus providing interactive information to managers during this process³⁶. A DSS looks into the decision making activities of managerial end users and stores such information. Managers at the tactical and strategic levels of an organisation need various types of information for their planning and controlling responsibilities. DSS uses the stored information to help such managers to solve the semi-structured and unstructured problems they usually face in their professional life. Thus DSS are able to support personal decision making styles and needs of individual managerial personnel.

4.4 Executive Information System (EIS)

EIS are management information systems that meet the requirements of the top management³⁷. Top executives acquire the information they need from many sources such as letters, memorandums, journals, magazines and reports produced manually as well as by computer. EIS therefore provides top management with immediate and easy access to selective information that is essential to realize an organisation's strategic objectives.

4.5 Expert System (ES)

An ES is a knowledge based information system that uses its knowledge about a specific and a complex application area to act as an expert consultant to end users³⁸. They are used for

³⁶ Cornford & Shaikh (2013), 70

³⁷ Cornford & Shaikh (2013), 70

³⁸ Cornford & Shaikh (2013), 71

either operational or management processes depending on whether they are giving expert advice to control operational processes or to help managerial end users in making decisions. ES provides answers to questions by making conclusions using knowledge stored in its knowledge database. It also provides the reasoning and judgment to a user.

4.6 Office Automation System (OAS)

An Office Automation System specifies the application of computer and communication technology for carrying out the office functions³⁹. OAS is a combination of hardware, software and people in information systems that process office transactions and support facilities such as word processing and electronic mail. These facilities help enhance the productivity of managers by providing them with secretarial assistance and better communication facilities. The computer based office automation systems not only fulfil the communication needs of the office managers but also help the office managers to communicate with external entities such as investors and vendors.

5 VRLS Information System Type

On the basis of the literature discussed so far it would be logical for this research to categorize the type, function and role of the information system under study so that a better perspective and understanding is attained in the line of the researcher's goal.

The VRLS is used to collect different types of data, which include vehicle details like the make, model, color, and year of manufacture, chassis number. Upon registering a vehicle, the system allocates it a car registration number, which is a unique number that is used to identify and track a car for the whole of its life span. The details of the vehicle owner are also captured with regard to name, surname, physical and postal address and contact numbers.

³⁹ Cornford & Shaikh (2013), 71

Any change of ownership for the vehicle is captured in the system. Official forms are used whereby the users would fill in these details and submit to any VRLS office for the formal registration process. The captured data form the basis for interfacing the system to other IS within the department i.e. for driver license issuance, motor vehicle carbon tax, police traffic fine tracking and payment, motor vehicle importation (immigration).

In a nutshell the VRLS system works as a crucial IS for the government to effect vehicle management, tracking, planning, tracking offences and curbing miscellaneous or criminal related acts. It is in this view that the researcher regards the VRLS as a complex transactional IS used to process and manipulate data from transactions such as registration, tracking, and inventory management and monitoring. These transactions include events such as payments and refunds for registering vehicles as well as licensing them.

6 Information System Development Life Cycle

6.1 Purpose and feasibility study

The development of an information system entails the existence of a key need or a purpose for the system. This need arises from the fact that there are numerous challenges being faced by an organization in achieving its main key objectives based on their mission statement. However despite the existence of this need, a very important stage has to be carried out first, the feasibility studies. The major purpose of the feasibility study is to establish whether a project should be done and how it should be done if justified: this activity is done to determine whether it is feasible to develop and install a system⁴⁰.

Feasibility study is a scientific approach or engineering method that is used to measure the capability and worthiness of developing a system given factors like legality, social impact to users, economic ability, technical competence and availability, and finally the operational means within the given environment.

⁴⁰ Ahituv Neumann & Svirun (2002) A system development methodology for ERP systems, 57

The legality dimension defines developing a system that operates within the laws defined by the country's legal system. Any developed system should conform to the stipulated laws which are clearly spelt through statutes like data acts which are provided in the legal framework of the country. What type of data is the system going to work on? Does it not infringe on violating basic human rights?

Social impact implies the effects induced by the system to the system end users, like change of responsibility and operational time. For instance the system should be operational 24 hours a day in seven days of a week. Suppose there is a breakdown at 00:00Hrs who is supposed to fix the problem and is the incumbent prepared to come at this moment? Not only does the social element look at these responsibilities but the shift of power that is going to happen when the system is introduced in an organization.

Social impact would parameterize issues like how would the users react to situations which include reduced work force because there is automation of the manual process. Demands imposed by the system could include coming to work on unexpected times of the day just because the system has malfunctioned, i.e. crashed or failed to work.

Economical parameter defines the ability of any information system to pay back upon given inputs or investments in the context of development, maintenance and concurrent consumables. It would be irrational to develop a system that would incur huge costs to maintain, develop and has a high rate cost of consumables, but with no future benefits to offset and balance out these costs. Logically taken, in any given circumstances it would be advisable to weigh out these options and recommend the most optimal system to adopt given the parameters defined.

Normally the options defined in a given environment of developing an IS system include the following; maintaining the current system which is a manual system, buying an off the shelf information system developed already and developing an information system from scratch to cater for the requirements defined. The economic feasibility intends to establish the cost-effectiveness of the system in terms of do the benefits outweigh the costs to develop the system, given options like improving the current situation, buying an off-the-shelf system or developing the system from scratch.

Technical competence and availability describes a situation where there are people who have the technical ability and prowess to maintain the developed system. In addition it also implies a situation, which is capable of hosting the system perfectly and or being expanded to host the system. The point implied is that you cannot think of having an information system to support an organization's functionality when it does not have any electrical or telecommunications infrastructure, or any IT infrastructure at all. This parameter also considers the availability of the skilled manpower to work with the system. Thus it is an investigation if the technology exists to implement the system.

Operation capability indicates the readiness and ability to work with the system within the organization. In simplicity what is implied are work practices and procedures able to support the new system.

The DRTS office as implied in their documentation for the VRLS feasibility study document, have acknowledged that key issues dealt within the feasibility study have been well addressed and catered for; however the document cannot be availed for public utilization as it is a classified and confidential document in accordance with Government policy and procedure. This document, according to the DRTS office, points out the identified need and importance of the VRLS in context of the prevailing situation and also the DRTS's readiness for this IS.

6.2 Requirements elicitation

A requirement is a functionality that an Information System must satisfy or a quality it must have⁴¹. Requirements are parameters used to define some functionality or a property in a system to be developed. Requirements can be broadly categorized as functional or non-functional requirements. Functional requirements describe the practicality of a system. For example, a certain requirement entails that users should login to gain access to the system resources. Therefore, a system user interface must be developed to facilitate login by users, hence fulfilling this practicality.

⁴¹ Robertson & Robertson (2006) Mastering The requirements Process, 592

Non-functional requirements tend to describe the properties of a system that are difficult to measure or analyse with regards to their functionalities. They are more inclined to defining the quality of services and therefore make it impossible to analyse and measure them. In some situations they are called quality requirement⁴².

A more realistic process of defining requirements is to split functional requirements into sections like business functions, technical functions, operational functions, user requirements and transitional requirements. This wide coverage of defining functions into specific categories facilitates coverage of all aspects of the system functionality, and hence minimizes the chances of producing a system that does not satisfy the needs of the user.

Requirements elicitation defines a process of how these requirements are elicited from the users of the system. The choice of the elicitation technique depends on the time and resources available to the requirements engineer, and of course, the kind of information that needs to be elicited⁴³. Most common requirements elicitation techniques belong to the following categories:

- a. Traditional methods were interviews, questionnaires and surveys, analysis of existing documentation and use of manual for existing systems⁴⁴.
- b. Prototyping is a method where a representative system is developed to provoke and invigorate thoughts of end users to provide constructive requirements⁴⁵.
- c. Model driven technique is where a model of the system is provided to hard drive the elicitation process and this mode is more or less similar to the prototype⁴⁶.
- d. Cognitive technique entails that the subject expert performs a task under observation and some requirements are noted, or end users are requested to perform card sorting

⁴² Nuseibeh & Easterbrook (2000) Requirements Engineering: A Roadmap, 37-47

⁴³ Nuseibeh & Easterbrook (2000), 39

⁴⁴ Nuseibeh & Easterbrook (2000), 40

⁴⁵ Nuseibeh & Easterbrook (2000), 40

⁴⁶ Nuseibeh & Easterbrook (2000), 40

and thus define the requirements in the process or the use of matrix with entities and users are asked to define the attributes, hence mapping the requirements⁴⁷. These all define techniques that can be implemented under the cognitive approach.

- e. Contextual approach uses the ethnographic approach where any observer watches a participant doing a task⁴⁸.
- f. Protocol analysis asks a subject to engage in some task and concurrently talk aloud, explaining his/her thought process⁴⁹.

6.3 Design and analysis

System analysis and design involves modelling the requirements⁵⁰. To model is to develop a replica of the system in order to facilitate understanding and implementation. In other engineering disciplines for instance civil engineering, this would be equivalent to drawing the architectural and building plan of a house to be built. Under software system analysis the developers build up models of the system in terms of static behaviour, dynamic behaviour and finally functional behaviour using software Unified Modelling Language (UML). In essence these are diagrams representing the aforementioned system behaviours⁵¹.

The reason for this stage is to gain a thorough understanding of the system based on the elicited requirement, as well as to communicate with the client and other stakeholders in ensuring that the proper representation of the system is understood very well for implementation purposes.

The system design stage is designing graphically the user interface and dialogues forms, which would show how the users would interact with the system. The logic kernel of the

⁴⁷ Nuseibeh & Easterbrook (2000), 40

⁴⁸ Nuseibeh & Easterbrook (2000), 40

⁴⁹ Goguen & Linde (1992) Techniques for Requirements Elicitation, 156

⁵⁰ Jacobson Booch & Rumbaugh (1999) The Unified Software Development Process; 179, 216

⁵¹ Jacobson Booch & Rumbaugh (1999); 186, 221

system or processing logic is also designed, including the data storage structures to store the information.

6.4 Implementation

System Implementation is the coding of the models into computer executable programs using software compilers⁵². The user interface, dialogue forms, data structures and processing logic are coded into implementation where the real task or requirements to be done are realized.

Testing is an aftermath stage that is done so that the single coded programs are tested to ensure unity of functionality; alpha testing to ensure that the system meets the design specifications and beta testing which is the actual system users' test determining the capability of the system in the user environment with actual data and many other tests like validation and verification⁵³.

System conversion is also done depending on the opted part i.e. Parallel, Direct, Phased and Pilot conversion to gradually and smoothly replace the default running system in methodological order. Lastly, it is the system documentation, which would oversee the development of manuals like the system technical document, system user manual and finally the deployment and maintenance manual.

6.5 Maintenance

Maintenance stage is the operational stage where the system has been deployed and is being utilized. However certain hidden and necessary requirements can surface and therefore different types of maintenance request or transform requests are forwarded for design changes or implementation changes.

System design features have been noted to have a particular effect on User Acceptance. Two key factors; Perceived Ease of Use and Usefulness of the system in dealing with intended

⁵² Jacobson Booch & Rumbaugh (1999), 268

⁵³ Jacobson Booch & Rumbaugh (1999), 313

chores in the working environment of an organization trigger the acceptance. System design features are issues that are dealt with during the elicitation of requirements, analysis and design stages of an Information System.

The activity is focused on the stakeholders of an IS in developing an impeccable system. These include software, hardware, the perceptions and needs of individuals, groups and organizations, resources, organizational culture and politics, a critical mass of users, implementation processes, the extent of system use and project management issues.

7 Information System stakeholders

A stakeholder can be defined as any group or individual that can impact or is impacted by a product or an artifact throughout the product's life cycle. Elpez & Fink⁵⁴ outline relevant stakeholders in the development of information systems as those that will ultimately use the system (end-users) and those charged with delivering those systems (IS professionals). Sarkar & Cybulski⁵⁵ defined stakeholders to imply individuals or groups who are directly involved or interact with an Information System and include users, developers, and decision makers or initiators as belonging to this category.

From the various IS definitions given in the literature review it is quite evident that a key focus of an IS is the people. This constitute of people who design, build, use, maintain and own the IS. A term used to describe a people component in an IS realm is stakeholders. Mukherjee acknowledges one of the major reasons for IS failures being contributed by stakeholders⁵⁶. What is noted by this observation is that IS has shifted from the technological perspective to an integrated system level approach by considering stakeholders and organizations as entities of interest in particular the organizational culture, the unique situational contexts and power conflicts germane to the situation.

⁵⁴ Elpez I & Fink D (2006) , 221

⁵⁵ Sarkar & Cybulski (2002) Consideration of Stakeholder Concerns in the Development of Web-enabled Systems, 773-779

⁵⁶ Mukherjee I (2008) Understanding Information System Failures from the Complexity Perspective, 309

This research wants to give a generic outline of IS stakeholders in order to gain a clear understanding of the users affected with the utilization of an Information System during its life cycle. With such a comprehension the researcher should be able to understand and delineate core stakeholders who are affected with the use of the VRLS.

- a. Project sponsor: This may be the client, customer, or organizational manager who will act as a champion for the project and provide organizational resources and direction when needed⁵⁷. In this research it is clear that the project sponsor is the Department of Roads Transport & Safety (DRTS) under the government of Botswana.

Elpez & Fink⁵⁸ mention that a critical group of stakeholders includes IT executives, CIOs, and IS managers, board of directors, etcetera. These stakeholders perceive the relevance and importance of the IS as a cost saving measure to business operations, adds value to the organization and should blend with the organizational structure. The research has identified the director of DRTS, the Assistant Director, Head of IT and the Permanent Secretary of the Ministry of Transport and Communication as the main executives for the VRLS system.

- b. Project Manager or Project Leaders: They are formally vested with the authority to guide, monitor, and direct the work of the other members of the project team. They must be well versed in how to select appropriate control strategies to guide their projects. It has been found that they are expected to reconcile the expectations of end-users with those of senior management⁵⁹. Project managers or leaders are supposed to have an oversight and overview of the IS project and be able to deliver the IS within the defined constraints like time, budget and resources available. They should manage the risk profile of the project, communicate in time, monitor and evaluate progress of the project.

A different department, called the Department of Information Technology (DIT) under the Ministry of Communications, Science and Technology was consulted as project managers for the VRLS system implementation and maintenance. They however tendered the implementation project to a private consulting company, and

⁵⁷ Lynn & Brett (2001) Exploring the role of the Project Sponsor

⁵⁸ Elpez & Fink (2006) , 222

⁵⁹ Elpez & Fink (2006), 222

each time there was some maintenance or upgrading work to be done on the VRLS, the job was tendered to a private company. However no further details were disclosed regarding the names for security reasons.

- c. **Technical experts:** Technical expertise is needed to provide a technical solution to an organizational problem. Technical experts can include systems analysts, network specialists, programmers, graphic artists, trainers, and so forth. Irrespective of their job titles, these individuals are responsible for defining, creating, and implementing the technical and organizational infrastructure to support the product of an IT project. The Department set up an Information Technology sub-unit, which has been staffed with necessary technical people, most of them from DIT to support the VRLS countrywide.
- d. **Information Systems development projects** are increasingly using the expertise of technical writers to compile project documentation, even those without sophisticated programming skills. Documentation is a critical aspect of projects as it constitutes a major part of communication with stakeholders i.e. compilation of system requirements specification, system architecture document, etcetera.

Technical documentation has been done in conjunction with the DIT and the private consultant company, which was involved in the implementation and or maintenance. These have continually provided the relevant technical guidelines and system literature. These documentations have been used in the training of VRLS users and also alerting the general public about the services and provisions availed by the VRLS.
- e. **Configuration Manager:** Software configuration management (SCM) is the task of tracking and controlling changes in the software. Configuration management practices include the revision of control and establishment of baselines⁶⁰. A configuration manager is also responsible for the Configuration Management Database (CMDB). He or she has to create, read, update, and delete permissions on all configuration items in the CMDB⁶¹. The process has been incorporated in the profile of the department's IT sub-unit and the consultants who are engaged as service contractors. A lot of

⁶⁰ Wikipedia, Software configuration management. 2010

⁶¹ IBM. Configuration management roles. 2010

changes were said to have been done and managed through these entities though no further details were provided.

- f. Systems Trainer: This person designs, documents and compiles training material for the system with regard to users. He/she also conducts training sessions for end users on real time and on organized schedules. The IT sub-unit has also been tasked to spearhead this task in the form of training sessions, refresher courses, formal induction for novices and general updates through the system notification functionality to constant users.
- g. System User: Sarkar & Cybulski define system users as other key stakeholders who are directly involved or interact with an IS⁶². These can be outlined as front desk officers, supervisors to the front and back desk officers, ancillary support services like accounts and finance and lastly the general public.

⁶² Sarkar & Cybulski (2002), 773-779

Chapter 3

IS Success and Evaluation

1 Introduction

Chapter 3 will review the literature on IS success and IS evaluation. The chapter will further dwell on information system evaluation parameters that affect system users in working with information systems such as user acceptance and satisfaction.

The research will look at the various information systems evaluation models and the evaluation framework postulated by each model: Why is an evaluation necessary, and what is the purpose of the evaluation outcome, and what is evaluated by each IS evaluation model? In exploring this dimension the research intends to select an IS evaluation model which is appropriate and explicit to measure and determine the extent to which the Vehicle Registration and Licensing System (VRLS) has been able to satisfy the needs of its users, hence the success of this technology.

Furthermore the chapter shall discuss the information system evaluation model adopted by the research and its relevancy to successfully evaluate the VRLS efficiency.

2 IS Success and Evaluation

Assessing the success of Information Systems (IS) has been identified as one of the most critical issues in the IS field⁶³. It is reported that the overall IS project success rate has increased from 16% in 1994 to 28% in 2000⁶⁴. The top 5 factors that have caused this significant increase are executive support, user involvement, experienced project manager,

⁶³ Al-Adaileh R M (2009) An Evaluation of Information Systems Success: A User Perspective, 226

⁶⁴ Johnson et al. (2001) Collaborating on Project Success

clear business objectives and minimized scope⁶⁵. User involvement appears top on the list and can therefore be regarded as very valuable towards achieving IS success.

The different definitions of what IS success is come as a result of the different stakeholders of IS. For users of the IS, success might be that the IS improves job performance, while from a manager's point of view reduced risk might be a better measure⁶⁶. The two points of view however, should be reconciled by the organizational goals' achievements, of which a people component is a key factor.

Studies in the smaller systems area have found factors determining IS success to include consultant effectiveness, vendor support, IS experience, sufficiency of financial resources, CEO support, and user participation⁶⁷. Each of these factors have an important role to play towards the success of an IS, and therefore if any is compromised or taken for granted, it may lead to unwanted results.

In recent years organizations have gained interest in the evaluation of IS because of their uncertainty to the actual value of these investments⁶⁸. This increased interest in evaluating IS investments is also due to the increased levels of investments organizations make on IS⁶⁹. It is unlikely in today's world for an organization to operate without any form of Information System in place. A lot of profitability in organizations has been attributed to IS, hence the increased levels of investment in it as various researches reflect.

An evaluation with respect to Technology or Information System provides an opportunity to test, tune, and compare approaches in order to improve system performance. The process involves assessment of the Technology or Information System with a view to enhance, improve or inform on deficiencies inherent with the technology or system under view.

⁶⁵ Johnson et al. (2001) Collaborating on Project Success

⁶⁶ Briggs et al. (2003) Special Issue: Information Systems Success, 4-5

⁶⁷ Yap Soh & Raman (1992) Information Systems Success Factors in Small Business, 597-609

⁶⁸ Lubbe S and Remenyi D (1999) Management of Information Technology Evaluation, 145-156

⁶⁹ Fitzgerald, G. (1998) Evaluating Information Systems Projects: A Multidimensional Approach, 15-27

Taylor-Powell & Douglass⁷⁰ remarks that when conducting an evaluation one should be directed with guidelines like: What is the purpose of the evaluation? What one would want to know? And how does the evaluator intend to use the outcome?

The evaluation of IT infrastructures may be regarded as the integration and management of business processes that controls the efficient and effective use of techno-based resources⁷¹. Evaluation could be further articulated as a way to manage efficiently and successfully IT resources, since a number of complex variables are involved and they include IT networks, people, data, and software. The main contentious issues on IS evaluation revolves around the people normally referred to as the users.

3 User Satisfaction and Acceptance

Acceptance and satisfaction are key evaluating parameters which are used to measure the success of an IS in organizations and these factors are profoundly linked to system users. User satisfaction is defined as the opinion of the user about a specific computer application, which they use⁷². User Information Satisfaction can be defined as the extent to which users believe the Information System available to them meets their information requirements⁷³.

The different definitions of user satisfaction look at the user being content with the system that is supposed to meet the user's minimum requirements in order for them to work with it, and also the technology used to implement the system should be convenient and user friendly. In a nutshell System User Satisfaction is the attitude of a user to the Information System being utilized by such a one in the context of his/her job daily work processes. Thus a way to measure system satisfaction from an IS end user implies determining the user attitude and there are various tools of doing that⁷⁴.

⁷⁰ Taylor-Powell Steele & Douglass (1996)

⁷¹ Irani (2002), 14

⁷² Doll & Torkzadeh, (1998) Developing a multidimensional measure of system-use in an organisational context, 171-185

⁷³ Ives Hamilton G B (1983) The measurement of user information satisfaction, 785-793

⁷⁴ Ogertschnig & Heijden (2004)

Information systems (IS) researchers have long recognized the relationships between service quality (e.g. the degree to which services are aligned with support factors that users deem as important) and user satisfaction, which many regard as a reasonable measure of IS success⁷⁵. Despite this widespread agreement among IS researchers, there is a lack of research examining the specific ways in which various support-related factors affect users' satisfaction⁷⁶.

It is imperative for IS researchers to study the causes of variations among the support needs of end-users so that these needs can be better understood, predicted, and fulfilled⁷⁷. In addition to differences in organizational and system characteristics, computer proficiency is not uniform and users may require training, education and support services that are tailored to their individual needs⁷⁸. The findings from this research should reveal the extent and quality of user support as it is a key factor towards IS success, and whether that support is tailored to the user's individual needs will reflect in their satisfaction.

User Acceptance has often been viewed as the pivotal factor in determining the success or failure of an Information System⁷⁹. Both practitioners and researchers have a strong interest in understanding why people accept information technology so that better methods for designing, evaluating, and predicting how users will respond to new technology can be developed⁸⁰.

Acceptance has been conceptualized as an outcome variable in a psychological process that users go through in making decisions about technology⁸¹. Or simply put, User acceptance is a psychological phenomenon that happens when a user is exposed to a given technology and the user can then develop a favorable or otherwise decision about using that technology. The

⁷⁵ Bailey & Pearson (1993) The Development of a tool for measuring and analyzing computer user satisfaction, 519-529

⁷⁶ Bailey & Pearson (1993)

⁷⁷ Mirani R & King W (1994) , 481-498

⁷⁸ Mirani & King (1994)

⁷⁹ Davis (1993), 475

⁸⁰ Dillon, A. and Morris, M. (1996) User acceptance of new information technology: theories and models, 4

⁸¹ Dillon & Morris (1996), 7

impact of user acceptance in general terms is observed through user rejection to utilize a given IS and therefore making it (i.e the IS) a failure.

4 Information systems evaluation models

An evaluation framework or a model is a tool that guides an evaluation as it defines relevant guiding questions, which facilitate a consistent gathering of data that is analyzed to formulate an informed decision⁸². Ong, Day & Hsu argue that evaluation frameworks are used to understand the users' needs and identify important dimensions and factors in the development of systems in order to broaden their acceptance. The evaluation framework is simply a structure of the research idea or concept in questions or steps and elaborates the research problem in relation to the relevant literature⁸³.

The evaluation framework can also be summarized in a schematic diagram that presents the major variables and their hypothesized relationships. Main elements that should be found in an evaluation framework are listed as: An outline of the main ideas for approaching the evaluation, the variables related to the evaluation problem, the conceptual link between the variables, a clear delineation of independent, dependent and intervening variables. A schematic diagram showing relationships between the main variables and the discussion of the relationship of the elements/variables is vital to enhance understanding of the evaluation thrust and finally the statement of hypotheses.

Many evaluation models exist; therefore the researcher wants to review them and select an appropriate model that will enable this research to explore and find adequate data to analyze and answer the research questions which are primarily focused on the effectiveness and efficiency of the VRLS system. The research has identified the Unified Theory Of Acceptance And Use Of Technology Model (UTAUT), Theory of Reasoned Action Model (TRA), Theory of Planned Behavior Model (TPB) and Decomposed TPB, Technology Acceptance Model (TAM), Total Evaluation and Acceptance Methodology (TEAM) and the

⁸² Ong Day & Hsu (2008) Development of an Evaluation Model for Question Answering Systems, 178-183

⁸³ Ong Day & Hsu (2008)

Delone & Mclean IS success Model as possible models that could be reviewed so to help adopt an appropriate model to evaluate the VRLS.

4.1 Theory of Reasoned Action Model (TRA)

The Theory of Reasoned Action (TRA) is built using five constructs: beliefs, attitudes, intentions, subjective norms, and behaviors⁸⁴. TRA is a broadly studied and well-established model from social psychology point of view and it considers and interprets the determinants of consciously intended behaviors⁸⁵. This theory is heavily reliant on measuring the behavior of a person on doing an intended behavior. According to this theory, an individual's behavior (e.g., use or rejection of technology) is determined by one's intention to perform the behavior, and this intention is influenced jointly by the individual's attitude and subjective norm, defined as "the person's perception that most people who are important to him think he should or should not perform the behavior in question"⁸⁶.

Attitude toward a behavior is determined by beliefs about the consequences of the behavior and the affective evaluation of those consequences⁸⁷. Beliefs are defined as the individual's subjective probability that performing a given behavior will result in a given consequence⁸⁸.

Affective evaluation is "an implicit evaluative response" to the consequence; thus the attitude construct in TRA is general in nature and is not anchored in any given belief set⁸⁹. This approach represents an information processing view of attitude formation and change which states that external stimuli influence attitudes only through changes in the person's belief structure⁹⁰.

⁸⁴ Southey G. (2011) Theories of Reasoned Action and Planned Behaviour Applied to Business Decisions, 43-50

⁸⁵ Southey (2011)

⁸⁶ Vallerand et al. (1992) Ajzen And Fishbein's Theory Of Reasoned Action as Applied to Moral Behaviour: A confirmatory Analysis, 98

⁸⁷ Vallerand et al. (1992), 98

⁸⁸ Dillon & Morris (1996), 7

⁸⁹ Dillon & Morris (1996), 8

⁹⁰ Dillon & Morris (1996), 8

However, attitude alone does not solely determine behavioral intentions⁹¹. Intentions are determined also by subjective norms, which, in turn, are determined by an individual's normative beliefs and motivation to comply with perceived norms⁹². The end result is a generalized model for understanding the determinants of human behavior in situations where people may exert their choices⁹³. The model has been used to make accurate predictions of human choice in situations as diverse as voting in elections and consumption of alcoholic beverages⁹⁴.

A major drawback of this model is that it relies mostly on the person's intention to carry out the intended behavior, noted as behavior intention (BI)⁹⁵. TRA has strong behavioral elements and assume that when someone forms an intention to act, that they will be free to act without limitation. In reality constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act⁹⁶. Figure 1 below clearly shows that TRA is wholly based on measuring behavior formed mainly from intentional behavior. The theory of planned behavior (TPB) attempts to resolve this limitation.

⁹¹ Dillon & Morris (1996), 9

⁹² Dillon & Morris (1996), 9

⁹³ Dillon & Morris (1996), 9

⁹⁴ Dillon & Morris (1996), 9

⁹⁵ Southey (2011)

⁹⁶ Southey (2011)

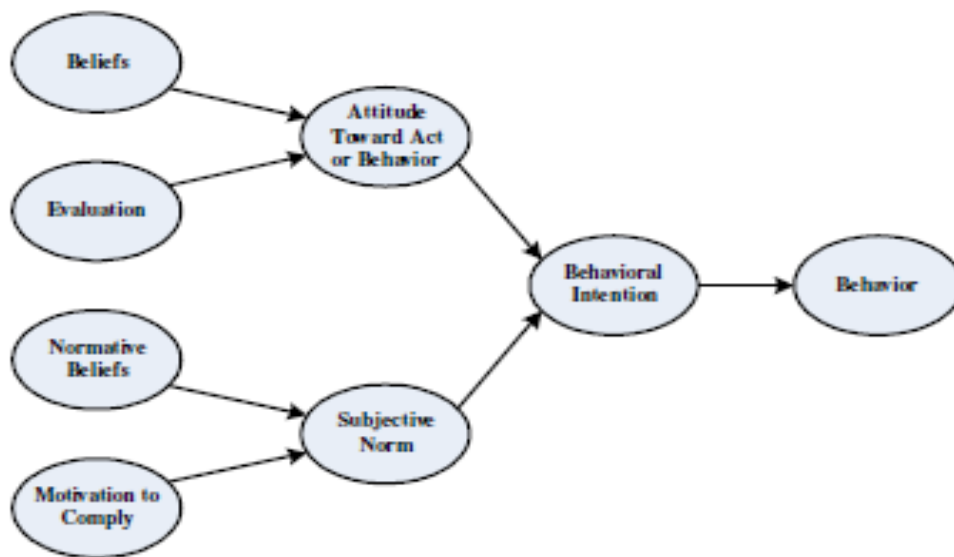


Figure 1: Theory of Reasoned Action Model⁹⁷

4.2 Theory of Planned Behavior Model (TPB) and Decomposed TPB

The Theory of Planned Behavior (TPB) is a descendant of TRA and adds a third antecedent of intention, perceived behavioral control, to the TRA model⁹⁸. Perceived behavioral control is determined by the availability of skills, resources, and opportunities, as well as the perceived importance of those skills, resources, and opportunities to achieve outcomes⁹⁹. TPB holds that attitudes, subjective norms, and perceived behavioral control are direct determinants of intentions, which in turn influence behavior¹⁰⁰.

The Theory of Planned Behavior (TPB) acknowledges that a person's acceptance and satisfaction of an IT's behavior is only indirectly impacted by their beliefs, social influence and is mediated by a person's intention. What is predominating is the user's presumption based on earlier experience on using such an object, and this constitutes a perceived

⁹⁷ Dillon and Morris (1996), 8

⁹⁸ Dillon and Morris (1996), 10

⁹⁹ Dillon and Morris (1996), 10

¹⁰⁰ Dillon and Morris (1996), 10

behavioral control. In summary TPB asserts that behavior is a direct, weighted function of intention and perceived behavioral control¹⁰¹.

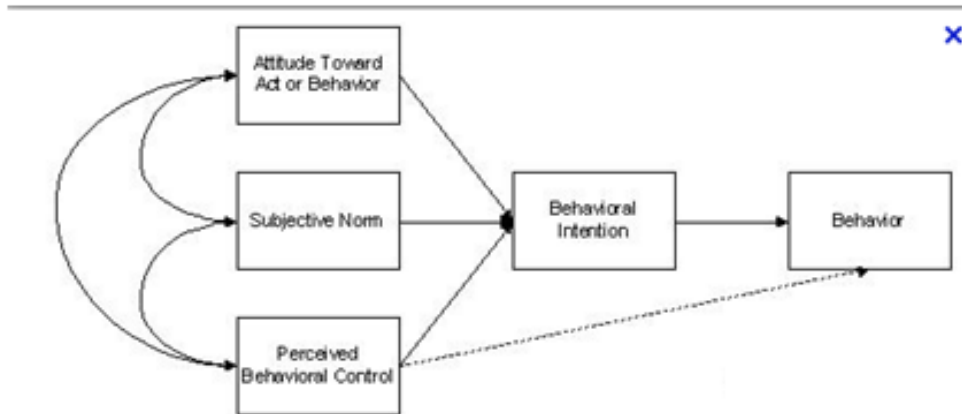


Figure 2: Theory of Planned Behavior Model¹⁰²

Decomposed TPB (DTBP) is an extension of the TPB model as clearly demonstrated by Figure 3 below. In attempting to apply TPB (which, like TRA, is a generalized model), a DTPB has also been examined in the IS literature which attempts to identify and model the specific antecedents to attitude, subjective norm, and perceived behavioral control relevant to IT use¹⁰³. Taylor and Todd suggest that perceived usefulness, perceived ease of use, and compatibility are antecedents of attitude (largely consistent with TAM)¹⁰⁴. In addition, peer influence and superiors' influence are taken as antecedents of subjective norm¹⁰⁵. Finally, modeling has been done of self-efficacy, resource-facilitating conditions, and technology facilitating conditions as determinants of perceived behavioral control¹⁰⁶.

¹⁰¹ Dillon & Morris (1996), 10

¹⁰² Dillon & Morris (1996), 10

¹⁰³ Dillon and Morris (1996), 10

¹⁰⁴ Taylor S & Todd P A (1995) Understanding information technology usage: A test of competing models, 144-176.

¹⁰⁵ Taylor & Todd (1995)

¹⁰⁶ Taylor & Todd (1995)

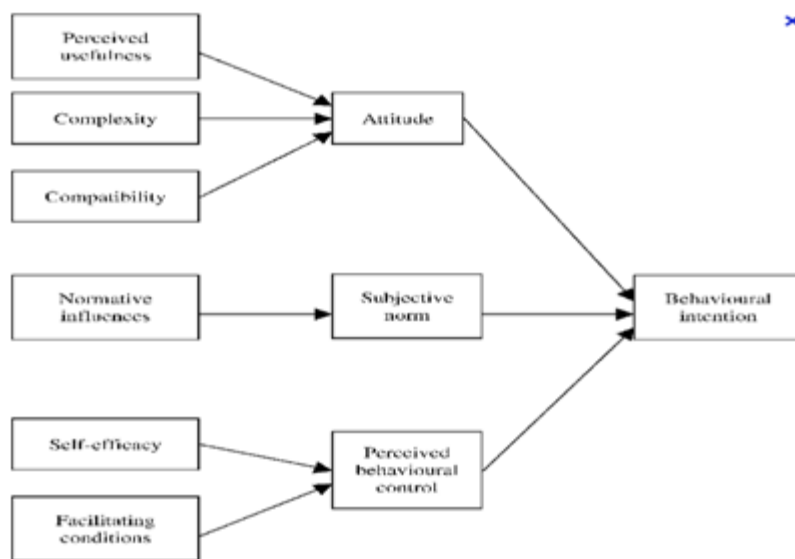


Figure 3: Theory of Decomposed TPB¹⁰⁷

DTPB offers two major advantages over the original model. The decomposition can provide a stable set of beliefs which can be applied across various operational settings, for instance perceived usefulness, complexity of technology used, etcetera, thus overcoming some of the disadvantages noted with the other traditional intention models¹⁰⁸. Furthermore the elaborate nature of TPB provides a more complete understanding of usage behavior relative to parsimonious models such as the Technology Acceptance Model (TAM).

The major limitation of TPB and its extension is that they do not account for the previous behavior within the model, which in many situations is accountable for the intended behavior. A person's utilization of a given technology or IS, is regarded as having a strong influence on whatever he or she might do with any subsequent similar scenario. One can think of a user who does not have any previous experience or exposure to the usage of a scanner and is told to scan a document or simply to send an email – it will most probably be a very complicated task for the first time.

¹⁰⁷ Vallerand et al. (1992)

¹⁰⁸ Dillon and Morris (1996), 10

4.3 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) is another adaptation of TRA that is very powerful and is also used to measure user acceptance of and satisfaction with Information Technology. The goal of TAM is to predict IS acceptance and diagnose design problems before users have experience with a system¹⁰⁹. TAM predicts that user acceptance of any technology is determined by two factors: perceived usefulness and perceived ease of use¹¹⁰.

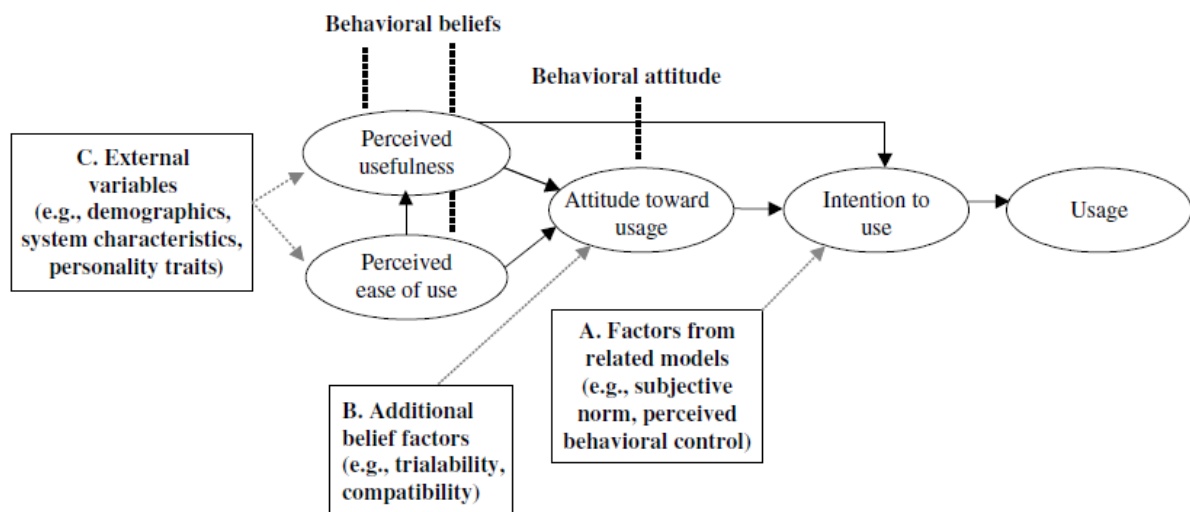


Figure 4: Technology Acceptance Model¹¹¹

The principle of TAM is demonstrated as given in Figure 4 and is clearly premised on three issues; external variables, belief factor and factors from related models. Within TAM, perceived usefulness (U) is defined as the degree to which a user believes that using the system will enhance his or her performance¹¹². Perceived ease of use (EOU) is defined as the degree to which the user believes that using the system will be free from effort¹¹³. Both U and EOU are specific perceptions and are anchored to specific beliefs users hold about the

¹⁰⁹ Dillon & Morris (1996), 8

¹¹⁰ Dillon & Morris (1996), 8

¹¹¹ Wixom & Todd (2005) A theoretical integration of user satisfaction and technology acceptance, 87

¹¹² Dillon & Morris (1996), 8

¹¹³ Dillon & Morris (1996), 8

system. According to TAM, U and EOU have a significant impact on a user's attitude toward using the system (A), defined as feelings of favorableness or un-favorableness toward the system¹¹⁴.

TAM theory postulates that the attitude towards using the computer system is jointly pinpointed by usefulness and the ease of use rather than being determined through the individual's attitude toward using the system¹¹⁵. In contrast the TRA and TPB models places more emphases on behavior, attitude and experience as key issues that would determine the use and acceptance of any given technology. However TAM on the other hand introduces issues like ease of use and usefulness as contributing factors to the output behavior.

4.4 Unified Theory of Acceptance and Use of Technology Model (UTAUT)

The UTAUT is a unified model that was developed by Vankatesh et al (2003) based on social cognitive theory with a combination of eight prominent information technology (IT) acceptance research models¹¹⁶. The model focuses on user intentions and the subsequent utilization of IS. The UTAUT model uses four core determinants of usage and intention (performance expectancy, effort expectancy, social influence, and facilitating conditions) alongside with four moderators (gender, age, experience and voluntariness of use) of key relationships¹¹⁷.

The unified theory of acceptance and use of technology (UTAUT) proposes that performance expectancy, effort expectancy, and social influence predict behavioral intention towards the acceptance of information technology¹¹⁸. The theory further proposes that facilitating

¹¹⁴ Dillon & Morris (1996), 8

¹¹⁵ Al-Gahtani Hubona & Wang (2007) Information technology (IT) in Saudi Arabia: Culture and the acceptance and use of IT, 8

¹¹⁶ Taiwo A A and Downe A G (2013) The Theory of User Acceptance and Use of Technology(UTAUT): A Meta-analytic Review of Empirical Findings, 49

¹¹⁷ Taiwo & Downe (2013), 49

¹¹⁸ Taiwo & Downe (2013), 48

conditions and behavioral intention predict use behavior in the acceptance of information technology.

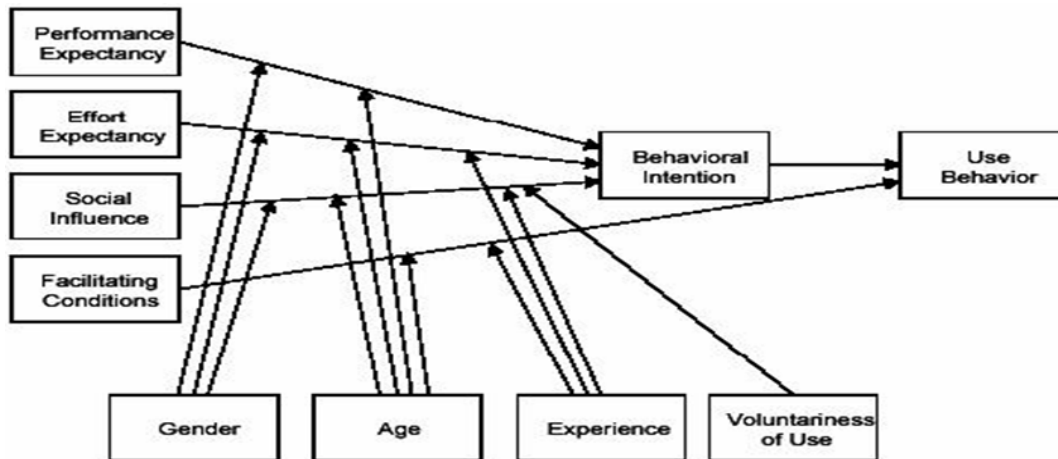


Figure 5: Unified Theory of Acceptance and Use of Technology model¹¹⁹

Ever since its inception, the theory has been assessed using different applications, and it has become a *dè factor* model of measuring user acceptance¹²⁰. The model is believed to be more robust than other Technology acceptance models in evaluating and predicting technology acceptance¹²¹. Although, the model has been widely used, tested and validated, the outcome of empirical studies has been inconclusive in respect to the magnitude, direction and significance of the relationships amongst the model¹²².

A meta-analytic study based on 37 selected empirical studies of the UTAUT model was conducted, in order to harmonize their empirical evidence. The outcome of the study, however, suggests that only the relationship between performance expectancy and behavioral intention is strong, while the relationships between effort expectation, social influence and

¹¹⁹ Taiwo & Downe (2013), 50

¹²⁰ Taiwo & Downe (2013), 48

¹²¹ Taiwo & Downe (2013), 48

¹²² Taiwo & Downe (2013), 48

behavioral intention are weak¹²³. Similarly, the relationship between facilitating condition, behavioral intention and use behavior is also weak¹²⁴.

In social sciences the issue of variety in statistical significance is common because of complexity in human behavior, and mixed outcomes in different studies are not uncommon, but it does undermine the accuracy of the models, UTAUT inclusive¹²⁵. Furthermore, it is noted that the UTAUT theory is merely cited in many articles but not actually used¹²⁶.

4.5 Total Evaluation and Acceptance Methodology (TEAM)

Total Evaluation and Acceptance Methodology (TEAM)¹²⁷ is a global framework constructed based on systemic and model theories. It has three dimensions: Role, Time (evaluation phase) and Structure (strategic, tactical, operational management level). The three dimensional structure of this model illustrates clearly the components of IS evaluation.

However, apart from the Role and Time aspects, the Structure aspect can be challenging. The selection of evaluation measures that match the management level can be challenging because the same measures can be categorized into more than one management level. As a whole, this framework is quite broad for a specific type of IS evaluation.

Meanwhile, an IT implementation and evaluation framework for individual users, known as the IT Adoption Model (ITAM), was constructed to study the individual user perspective and their potential IT adoption¹²⁸. From the individual user perspective, this framework includes comprehensive evaluation criteria and relationships among them. This framework is clearly insufficient for a wider scope of evaluation, which involves the organizational aspect.

¹²³ Taiwo & Downe (2013), 48

¹²⁴ Taiwo & Downe (2013), 48

¹²⁵ Taiwo & Downe (2013), 48

¹²⁶ Taiwo & Downe (2013), 55

¹²⁷ Grant A, Plante I & Leblanc F (2002) The TEAM methodology for the evaluation of information systems in biomedicine, 195-20

¹²⁸ Dixon D R, 1999. The behavioural side of Information Technology, 117-123

4.6 DeLone and McLean's IS success evaluation models

Since IS success can be assessed at different levels it has been hard to establish an overall measure for IS success that is totally clear and well defined^{129 130}. Furthermore, the lack of consensus between studies of IS success as well as the different scopes and approaches of researchers has made it hard to compare research findings and establishing a research tradition¹³¹. In 1992 IS researchers DeLone and McLean had a breakthrough proposing a model of IS success¹³².

Since the DeLone and McLean IS success model was presented in 1992 it has been referred to in over 1000 articles in refereed journals. Today it is one of the most commonly cited models of IS success¹³³. The model has its fundamentals from the work of Shannon and Weaver from 1949 and Mason from 1978¹³⁴.

What DeLone and McLean presented was a systematic combination of individual measures from previous research and an attempt to show off the interdependent process relationship of six IS success dimensions^{135 136}. Two of the main contributions of the DeLone and McLean model was that the model provided a classification scheme for IS success measures used in prior literature, and secondly it suggested interdependencies between the different success

¹²⁹ Wu, J-H. and Wang, Y-M. (2006) Measuring KMS Success, 728-739

¹³⁰ Agourram H & Talet AN (2006) The Evaluation of Information Systems Success: a new perspective, 3

¹³¹ Agourram H & Talet AN (2006) The Evaluation of Information Systems Success: a new perspective, 3

¹³² DeLone and McLean (2003), 11

¹³³ Al-Adaileh (2009), 228

¹³⁴ Edlund S. and Lovquist A. (2012) The Role of System Administrators in Information System Success, 8

¹³⁵ Sedera, D. and Gable, G. (2004) A Factor and Structural Equation Analysis of the Enterprise Systems Success Measurement Model, 449-464

¹³⁶ DeLone & McLean (2003), 10

dimensions¹³⁷. The six different dimensions they drew out were system quality, information quality, use, user satisfaction, individual impact, and organizational impact¹³⁸. What they found was that the success dimensions did not only affect IS success but that they are also interrelated¹³⁹. Figure 6 illustrates the model layout.

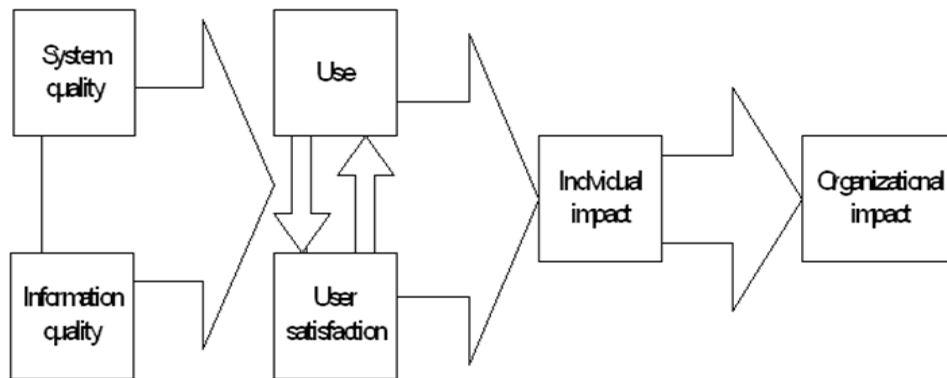


Figure 6: DeLone and Mclean 1992 Model¹⁴⁰

In 2003 DeLone and McLean published an article reflecting over the research that had been done since they published their IS success model in 1992¹⁴¹. The DeLone and Mclean 2003 model was developed to mitigate the problems of the 1992 model and the following were added as in figure 7; Service Quality, Organizational Structure and the Individual and Organizational Impact were combined to form Net Benefits.

DeLone & McLean¹⁴² explains that the constructs of the D& M's 2003 model influence each other in a temporal and causal way. System quality, information quality and service quality

¹³⁷ Seddon, P.B. and Kiew, M-Y. (1996) A Partial Test and Development of DeLone and McLean's Model of IS Success, 90-109

¹³⁸ DeLone & McLean (2003), 10

¹³⁹ DeLone & McLean (2003), 11

¹⁴⁰ DeLone & McLean (2003), 12

¹⁴¹ DeLone & McLean (2003)

¹⁴² DeLone & McLean (2003), 11

singularly and jointly affect both system use and user satisfaction. System use, relies on user knowledge and training, and can influence the information quality since user's knowledge in using the system can affect reports, images and prescriptions produced by the system.

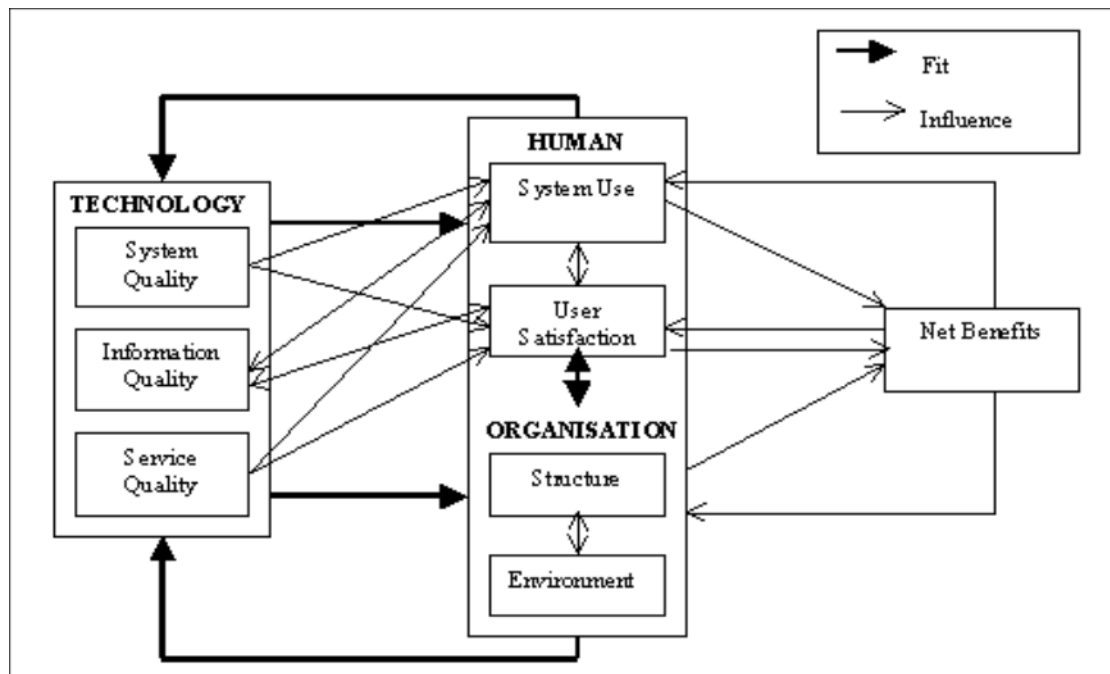


Figure 7: DeLone and Mclean 2003 Model¹⁴³

The level of system use can affect the degree of User satisfaction and vice versa. Similarly, the Environment factors such as organization policy and politics can affect organizational structure while factors in organizational Structure will affect the population served in the Environment.

System Use and User Satisfaction are direct antecedents of Net Benefits. Net Benefits will then affect System Use and User Satisfaction. Similarly, organizational Structure and Environment are direct antecedents of Net Benefits. Net Benefits will then have impact on organizational Structure and environment Services quality, organizational structure and environment, and net benefits were newly added dimensions. These added dimensions to the

¹⁴³ DeLone & McLean (2003)

D&M's 2003 model added a measure of effectiveness to the evaluation process of an IS¹⁴⁴. The dimensions of the DeLone and McLean's 2003 IS success model will next be presented in detail.

4.6.1 System quality

The system quality construct is associated with a system's overall performance¹⁴⁵. DeLone and McLean explain system quality as the desired characteristics of the IS which purpose is to produce information that should be used by users and decision makers¹⁴⁶. Typical issues that influence system quality measures are ease of use, system flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response times¹⁴⁷.

Ease of use and ease of learning can be explained as the degree that learning and using the system will be perceived as effortless by the user¹⁴⁸. This is an important part of system quality since effort can be seen as a limited resource that all people can chose to allocate in what way they like¹⁴⁹. Hence, IS that are perceived as effortless to use by users are more likely to be accepted by users^{150 151}.

Flexibility is another important factor that several researchers have used as a component of system quality^{152 153 154}. The flexibility of the system refers to the possibilities to make

¹⁴⁴ Bharati P & Berg D (2005) Service Quality from the Other Side, 367-380

¹⁴⁵ DeLone & McLean (2003)

¹⁴⁶ DeLone & McLean (1992)

¹⁴⁷ Petter Delone & Mclean (2008)

¹⁴⁸ Edlund and Lovquist (2012), 11

¹⁴⁹ Edlund and Lovquist (2012), 11

¹⁵⁰ Davis (1993), 476

¹⁵¹ Rivard et al. (1997) Development of a Measure to Assess the Quality of User-Developed Applications, 44-58

¹⁵² Miller J and Doyle BA (1987) Measuring the Effectiveness of Computer-Based Information Systems in the Financial Service Sector, 107-124

¹⁵³ Rivard et al. (1997)

¹⁵⁴ Bharati and Berg (2005)

changes or adjustments in the system in cases of new demands, conditions, or circumstances^{155 156}. These parameters are derivatives of the user perception during the interaction process with an IS. Evaluating quality of a system is something that no other evaluation model has ever done, yet this model has catered for this provision.

4.6.2 Information quality

Information quality is centered on those desired characteristics of information that an IS generates, e.g. management reports and web pages. When measuring end-user satisfaction information quality is often one of the key variables; hence, it is often seen as a component of user satisfaction rather than a unique construct¹⁵⁷.

The quality of the information that the IS produce will determine users' satisfaction of using the IS to solve their tasks, if the information that the system produce is very hard to understand or not accurate enough this might lead to frustration amongst users¹⁵⁸.

Some of the most well established components of information quality are: accuracy, completeness, relevancy, timeliness, and format of the information¹⁵⁹. Most information quality measures are subjective, as they are derived from the user perspective – for instance, while accuracy refers to the correctness of the information from an IS, completeness reflect the comprehensiveness of this information from the user's point of view.

Information relevancy is important to assess because it measures whether the information provided by the system is equal to the information that users need or require¹⁶⁰. Format of output is an important part of information quality because it provides an insight about

¹⁵⁵ Bailey and Pearson (1983)

¹⁵⁶ Wixom, B.H. and Watson, H.J. (2001). An Empirical Investigation of the Factors Affecting Data Warehousing Success, 17-41

¹⁵⁷ Petter Delone & Mclean (2008)

¹⁵⁸ Allwood C M (1998) The creation and nature(s) of indigenized psychologies from the perspective of the anthropology of knowledge

¹⁵⁹ Petter Delone & Mclean (2008)

¹⁶⁰ Bailey and Pearson (1983)

whether users think that the information provided by the IS is presented in a good and understandable way or not¹⁶¹.

4.6.3 Service quality

Service quality is concerned with the overall support delivered by the service provider, regardless of whether the service is delivered by the internal department or outsourced to external vendors^{162 163}. This is the quality of the support that system users receive from the IS department and IT support personnel, for example: responsiveness, accuracy, reliability, technical competence, and empathy of the personnel staff¹⁶⁴.

Responsiveness refers to whether a fast and effective service is provided by the support department to assist the IS users. Assurance indicates the users' confidence in the knowledge of and assistance they get from the support unit. Reliability is essential because it indicates if users perceive the support unit as dependable, that is if they provide service when they say they will and if they do something if they promise to do so^{165 166}. Empathy is an important part of service quality because it reflects the support units concern for the users, if they provide individual attention and have understanding for users' specific needs¹⁶⁷.

Apart from these components, assessment of service quality should also include improvement of the user's system knowledge which includes two components¹⁶⁸. The first component is users' understanding of the system relating to the degree of system comprehension amongst the users. The second component is the degree of training provided to users which reflects the

¹⁶¹ Bailey and Pearson (1983)

¹⁶² DeLone & McLean (2003)

¹⁶³ Petter Delone & Mclean (2008)

¹⁶⁴ Petter Delone & Mclean (2008)

¹⁶⁵ Pitt Watson & Kavan (1995) Service Quality: A Measure of Information Systems Effectiveness, 173-187.

¹⁶⁶ Jiang Klein & Carr (2002) Measuring Information System Service Quality: SERVQUAL From the Other Side, 145-166

¹⁶⁷ Jiang Klein & Carr (2002)

¹⁶⁸ Li EY (1997) Perceived Importance of Information System Success Factors: A Meta Analysis of Group Differences, 15-28.

amount of training that users receive in order to increase their knowledge about the IS^{169 170}¹⁷¹. These two components are important because system understanding and training makes users less dependent on the support unit which gives them greater user satisfaction¹⁷².

4.6.4 System use

System use is the degree and manner in which staff and customers utilize the capabilities of an information system - for example: amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use¹⁷³. System use is concerned with the frequency and breadth of system usage¹⁷⁴. The actual use of the system as a measure of IS success refers to voluntary instead of mandatory use. Other issues pertinent to system use are the person who uses it and their levels of use and training. System use is also related to individual knowledge and belief. These measures are related to human acceptance and resistance.

Resistance can be regarded as an important factor of system success¹⁷⁵. As different types of systems are usually related with a particular type of function and user, the reasons for resistance might differ among system types. Resistance can be viewed from one of the following theories: people-oriented, system-oriented and interaction-oriented¹⁷⁶. People-oriented theory states that resistance results from users' (groups or individuals) internal factors. Personal characteristics such as age, gender, background, value and belief have been suggested as influencing an individual's attitude towards technology¹⁷⁷.

¹⁶⁹ Bailey and Pearson (1983)

¹⁷⁰ Ives Hamilton G B (1983) The Measurement of User Information Satisfaction, 785-793

¹⁷¹ Li (1997)

¹⁷² Magal SR (1991) A model for evaluating Information Center Success, 91-106

¹⁷³ Petter Delone & Mclean (2008)

¹⁷⁴ DeLone & McLean (2003)

¹⁷⁵ Hornik et al. (2003)

¹⁷⁶ Hornik et al. (2003)

¹⁷⁷ Hornik et al. (2003)

System oriented theory suggests that resistance results from the system design factors or relevant technology including user interface and system characteristics. Interaction theory explains resistance from the interaction between people and system factors, thus assessment of a system varies across settings and users¹⁷⁸. Job insecurity and fear are some examples of interaction resistance.

4.6.5 User satisfaction

User satisfaction has traditionally been seen as a measure for IS success and can be described as the summary of a person's attitudes or feelings towards several factors affecting that specific situation^{179 180}. It is subjective in nature as it depends on whose satisfaction is measured. Some studies relate user satisfaction to perceived usefulness and user attitudes towards IS. User satisfaction is defined as the overall evaluation of the user's experience in using the system and the system's potential impact.

User satisfaction has previously been measured indirectly through system quality and information quality¹⁸¹. Baroudi and Orlikowski early developed the idea that a single measure could be used to assess user satisfaction if it is an overall indication of user satisfaction one was after¹⁸². This was exactly what Rai et al. did, trying to find a global measure of user satisfaction simply by measuring how people rated their overall satisfaction with the system¹⁸³. People are usually quite honest when it comes to rating an IS as for whether they are satisfied with it or not and so this measure could be trusted even though it is subjective.

¹⁷⁸ Hornik et al. (2003)

¹⁷⁹ Bailey and Pearson (1983)

¹⁸⁰ Raymond, L. (1990) Organizational Context and Information Systems Success, 5-20

¹⁸¹ Rai et al. (2002) Assessing the Validity of IS Success Models: An Empirical Test and Theoretical Analysis, 50-69

¹⁸² Baroudi and Orlikowski (1988) A Short-Form Measure of User Information Satisfaction: A Psychometric Evaluation and Notes on Use 44-59

¹⁸³ Rai Lang & Welker (2002)

4.6.6 Net benefits

Net benefits took the place of what initially was individual and organizational impact in the DeLone & McLean's 1992 IS success model, as the impacts of IS moved beyond the immediate users. The change from impact to net benefits was due to the fact that impact can be seen as either positive or negative, while net-benefits allow researchers to find both positive and negative consequences of using the system, not limiting the results to whether the system is good or bad¹⁸⁴.

Net benefits is the extent to which IS are contributing to the success of individuals, groups, organizations, industries, and nations - for example: improved decision-making, improved productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development¹⁸⁵.

A system can benefit a single user, a group of users, an organization or an entire industry. Individual impact is the effect of information on the behavior of the recipient. It is associated with performance as well as changes in user task such as change in work activity and improved productivity. Torkzadeh and Doll classified the possible benefits of using IS into four different categories: productivity, innovation, management control, and customer satisfaction¹⁸⁶.

One of the main shortcomings of the DeLone and McLean model is that it does not present any appropriate measures for each one of the success dimensions¹⁸⁷. DeLone and McLean instead state that all measures should be based on the objectives and context of the research being done, and to the extent that it is applicable measures tested and proven by other researchers should be used¹⁸⁸.

¹⁸⁴ Edlund and Lovquist (2012), 13

¹⁸⁵ Petter DeLone & McLean (2008), 239

¹⁸⁶ Torkzadeh and Doll (1998)

¹⁸⁷ Edlund & Lovquist (2012), 9

¹⁸⁸ Edlund & Lovquist (2012), 9

The lack of established measures for the success dimensions can be seen as a result of the complex nature of IS¹⁸⁹. Apart from being seen as a shortcoming of the model it is also one of the main benefits since the model can be applied to different contexts¹⁹⁰. However, an attempt should be made to reduce the number of measures to establish consistent appropriate measures of IS success to enhance the possibility to compare and validate findings^{191 192}.

5 Summary

In comparison to all existing IS evaluation models the DeLone and McLean's IS success model appears to be more compelling in commendably evaluating key functional aspects of an IS. The argument stems from the mere definition of an IS that cites an IS as a scientific field of study that addresses the range of strategic, managerial and operational activities involved in the gathering, processing, storing, distributing, people, and use of information, and its associated technologies, in society and organizations¹⁹³.

The D&M 2003 model captures the entire spectrum of an IS's utilization by considering human behaviour, organizational influence and technology impact, system design and functionality through system quality. Therefore this research will consider this model as the key model to adopt in evaluating the success of the VRLS.

A closer analysis of the VRLS reveals that it is a transactional information processing system that supports decision making through generating reports on timely basis¹⁹⁴. The VRLS has to be present in the entire country to ensure smooth transaction of vehicle registration and management at any given time¹⁹⁵.

¹⁸⁹ DeLone & McLean (1992)

¹⁹⁰ Petter Delone & Mclean (2008), 240

¹⁹¹ DeLone & McLean (1992)

¹⁹² DeLone & McLean (2003)

¹⁹³ Thakur B B. (2011)

¹⁹⁴ Which fits under the Information Quality parameter of the D & M IS success model, backing-up the using of this model to evaluate the VRL system

¹⁹⁵ This is covered under the System Quality parameter of the D & M IS success model

The VRLS is operated by the discussed stakeholders in carrying out their roles and responsibilities and these constitute the system users. In this context, these facts conjure the element of VRLS human interaction, organizational factors, satisfaction and acceptance by system users. The scope of this research however will only focus on the end users (front-desk officers and their supervisors) as the stakeholders who interact with this system on a daily basis in assisting the external customers.

The ultimate question of this research is to evaluate the VRLS success from the user's point of view using the dimensions of the DeLone and McLean's 2003 IS success model.

Chapter 4

Research Methodology

1 Introduction

The previous chapter dealt with the review of literature concerning evaluation frameworks used to conduct an appraisal of information systems. Particular focus was given to selecting and adopting a suitable evaluation model to be used to assess the vehicle registration and licensing system (VRLS) used by the Department of Transport Roads and Communication (DTRS) of the Botswana government in registering, monitoring, tracking vehicles, testing and issuing of vehicle licenses.

This chapter shall dwell on defining and laying out a research methodology to be used in conducting the evaluation of the VRLS systems. It will describe the research design or plan proposed for this research. The research design shall mainly focus on how the Information System evaluation model recommended in the literature review will be used to assist in deriving questions for populating research instruments, collection of primary data related to postulated in the research instruments, analysis of the responses and finally presentation of deduced results.

Critical research concepts of reliability and validity will be dealt with in this chapter. This chapter also clarifies the instruments and tools to be used in this research. Issues of sampling including the population, sample, and sample size, sampling technique(s) are dealt with in this chapter. The chapter will also clarify the data analysis methods to be employed. Ethical considerations to be observed by this research are also clarified and issues such as confidentiality and informed consent are explained in this chapter.

2 Research design

Research design is a plan that gives a guideline as to how a research project shall be executed. The plan provides details on logistics and arrangements on how to collect research

data, techniques to be used to collect the data and the method applicable¹⁹⁶. Yin explains the logistical arrangement and conditions for collecting and analyzing of data in a manner that seeks to add relevance to the research topic, which in turn brings about optimization in the research¹⁹⁷. The research to be conducted in this study is made within the business terrain where practice, theory and social relations are inseparable entities; hence the need for observations and judgments that are influenced by human values.

This research employed the Quantitative research technique which uses numeric data, structured questions and conducts a statistical analysis to confirm or deduce the facts of a given theory¹⁹⁸. The researcher had initially resolved to adopting both the Qualitative and Quantitative research approach, hence combining the Structured Questionnaire and Interviews method of data collection. Along the way the way this approach had to be changed as there was a very poor response from the respondents on being available for the interviews. The researcher therefore changed the research approach to only Quantitative.

2.1 The quantitative method

The quantitative research method involves obtaining and analyzing data in numerical form. This research method provides values in a statistical form. After familiarization with the problem area the researcher develops a hypothesis and creates an instrument to gather data to test the hypothesis. After the researcher familiarized herself with the nature of the problem and generating the hypothesis, quantitative methods provided focus on using the data to confirm or reject hypotheses.

¹⁹⁶ Yin R K (2008) *Design and Methods* 5

¹⁹⁷ Yin R K (2008)

¹⁹⁸ Bazeley P, (2002) *Issues in Mixing Qualitative and Quantitative Approaches to Research*

In social research the main tool used in quantitative research is the structured questionnaire as a standardized instrument to ensure that responses fit a predetermined criterion. Questions used in quantitative research are closed ended, uniform and rigid. Respondents are asked similar questions in the same order and time to avoid the possibility of anything tainting the data that is obtained. The data obtained are useful for determining the quantity of variation and predict causal relationships among or between variables.

Researchers who use quantitative methods emphasize the measurement and analysis of causal relationships between variables. Results in quantitative research are usually illustrated and summarized by the use of charts and graphs. The results are expressed as statistics. Quantitative research can be used to determine the characteristics of a population. This research method has the advantage of high reliability because it cannot be subject to bias through subjective interpretations. While quantitative methods are castigated as too structured (using structured questionnaires or structured observation), they are also praised for their high reliability.

2.2 Data collection

A structured questionnaire was used to obtain specific responses for easier quantitative analysis. The questionnaire is made up of mostly closed-ended questions for easier and clearer data analysis. The questionnaire was constructed in very simple English. There were simple instructions on how to answer the questions to cater for various language competency levels of potential respondents. The length of the questionnaire was made modest to ensure the respondents do not get frustrated with a long questionnaire.

The questions for the questionnaire were formulated using the key thematic points or issues as indicated in the DeLone & McLean IS evaluation model selected to assess the VRLS. The aim of the questionnaire was to capture the users' perceptions of the six success dimensions found in the DeLone and McLean's 2003 IS success model.

Each one of the success dimensions was measured by one or several components incorporated in questionnaire questions, which have also been used in previous researches. Adopting or adapting questions used by other researchers makes it possible to compare results but most importantly it provides reliability¹⁹⁹. Appendix 9 shows the formulated questions per each topic. The answers to the questionnaires have definite options and numbers opting for a particular response and can be counted and represented on charts and graphs.

The questionnaire consists of 25 questions. Questions 1-3 asked the respondents to provide some personal information like age, gender and educational background. This was to shed some light on the demographic information of the respondents. Questions 3-25 were formulated into statements asking the respondents to give their answers mostly on a five-point Likert scale. Likert scales are often used to capture respondent's opinion towards a statement or series of statements (Saunders *et al.* 2009). The five-point rating scale used in this questionnaire ranges from strongly disagrees to strongly agree, never to always and poor to excellent, depending on the type of question asked.

The questionnaire is broken into eight (8) parts, the first part being on the demographic information, followed by the six dimensions of the Delone and McLean IS success model namely; System Use, Net Benefits, then User Satisfaction, Service Quality, System Quality and Information Quality²⁰⁰, then lastly having the part with General characteristics which can fall under any of the six mentioned dimensions.

The assessment of *system use* was made following the sub-components proposed by Petter *et al.* namely: amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use²⁰¹.

¹⁹⁹ Saunders Lewis & Thornhill (2009) Research Methods for Business Students

²⁰⁰ Delone & McLean (2003)

²⁰¹ Petter Delone & Mclean (2008) Measuring information systems success: models, dimensions, measures & interrelationships, 239

The assessment of *information quality* was made by reference to the five components proposed by Bharati and Berg²⁰² namely: information accuracy, completeness, timeliness, format, and relevancy. Several researchers have used these five components to assess information quality (e.g. Bailey and Pearson 1983; Doll and Torkzadeh 1988; Al-adaileh 2009).

To evaluate the *system quality* the following issues were considered which influence the quality of the system: ease of use, system flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response times²⁰³.

To measure *service quality* several measures were selected which have been suggested by Li and Pitt Watson & Kavan. namely: users' understanding of the system and training provided to users as well as reliability, responsiveness, assurance and empathy respectively^{204 205}. These components have also been used by other researchers to assess service quality (e.g. Bailey and Pearson²⁰⁶, Ives Hamilton G B²⁰⁷).

To assess *user satisfaction* measures like the users' attitude and feelings towards a system, as well as perceived usefulness, the user's experience in using a system and the system's potential impact used by researchers like Bailey & Pearson²⁰⁸ and Raymond²⁰⁹ were applied.

²⁰² Bharati and Berg (2005)

²⁰³ Petter Delone & Mclean (2008), 238

²⁰⁴ Li (1997)

²⁰⁵ Pitt Watson & Kavan (1995)

²⁰⁶ Bailey & Pearson (1983)

²⁰⁷ Ives Hamilton G B (1993)

²⁰⁸ Bailey & Pearson (1983)

²⁰⁹ Raymond (1990)

The *net benefits* dimension, which is realised in measures like improved decision-making, improved productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development²¹⁰, was also assessed.

In some studies a question to each sub-component was asked, however, because the questionnaire would have been otherwise too extensive, the researcher chose to include only a few questions for each dimension which may best capture the essence of the measures supporting it.

The researcher distributed the questionnaire to respondents at their place of work in and around Gaborone. Where possible the researcher waited for the respondents to complete the questionnaire in order to ensure a good response rate. Where respondents could not complete the questionnaire on the day it was handed, the researcher made follow ups and collected from those left behind.

3 Issues of validity and reliability

Validity and reliability are two important measures when defining the quality of a research project. These measures therefore are going to be given the respect they deserve. They are dealt with below.

3.1 Reliability

The concept of reliability refers to the consistency of the data-gathering instrument in obtaining the same results in a similar situation²¹¹. It refers to the extent to which an instrument maintains consistency in whatever it is measuring, wherever it is administered as long as the population is the same. Reliability is related to an instrument that gives consistent

²¹⁰ Petter Delone & Mclean (2008), 239

²¹¹ Sharan B M (1995) What Can You Tell From An N of 1: Issues of Validity and Reliability, 57

results and consistency gives the researcher confidence that the results actually represent what he intended to study²¹². Reliability can be assessed by posing the following questions.

- a. Will the measures yield the same results on other occasions?
- b. Will similar observations be reached by other observers?
- c. Is there transparency in how sense was made from the data?

Given that reliable instruments obtain similar responses when administered to different respondents, the researcher made it a point to simplify the questions as much as possible in instrument design. Objectivity refers to the absence of subjective judgments²¹³. In addressing this problem, the questionnaires in this study were pretested. In short, the researcher has exercised caution to ensure that the results are reliable. This is aptly summarized in the statement that if care is not taken bias can creep into the research.

3.2 Validity

Validity is defined as that quality of the data gathering instruments that enables them to measure what they are supposed to measure²¹⁴. Thus it is also defined along the lines of defensibility of the inferences researchers make from the data collected through the use of the instrument.

There are three forms of validity: construct validity, internal validity and external validity²¹⁵. For construct validity it will be important to establish correct operational measures for the concepts that are being studied and that objective judgment is used to collect data. Quantitative research validity refers mainly to construct validity in which the construct is the initial concept, notion, question or hypothesis that determines data to be gathered and how it is gathered.

²¹² Sharan (1995), 56

²¹³ Sharan (1995), 56

²¹⁴ Sharan (1995)

²¹⁵ Sharan (1995)

The way the instrument is constructed determines its credibility. Internal validity will entail establishing the causal relationships, which will show that specific conditions lead to other conditions²¹⁶. Validity will concern the establishment of the field to which findings can be generalized. Thus the findings of the study will be generated analytically rather than statistically.

Again the validity of the study may be further influenced by the fact that people's perceptions can vary over time, which makes it difficult for the researcher to achieve the same results even if the same sample were to be used. The researcher did whatever was possible to ensure that the data collected, captured and analyzed was valid and relevant to this study.

4 Sampling strategy

4.1 Population

A population is a set of all members for which a study intends to make a reference²¹⁷. It refers to all possible observations of the random variable under study. The specific population types are Target Population, Subject or Respondent Population and Strata or Stratum Population²¹⁸. The Target population is defined as a group of individuals who meets the criteria²¹⁹. This is the actual population to which the researcher would like to generalize.

The ideal population for this study would be all VRLS users in all stations in Botswana. However because of constraints of cost, distance and time it was impossible to visit all DRTS stations distributed countrywide. Gaborone and the surrounding areas have got many working stations, which are fully deployed with the VRLS system, and this particular part of the country happens to have a bigger portion of the people making the overall population of Botswana.

²¹⁶ Sharan (1995), 53

²¹⁷ Nalzar (2012) Chapter 8- Sample and Sampling Techniques

²¹⁸ Nalzar (2012)

²¹⁹ Nalzar (2012)

The target population for this study was therefore all users of the VRLS system in all the working DRTS stations in Gaborone and as many areas around as could be reached. The areas covered therefore included all DRTS offices in Gaborone as well as Francistown, Letlhakane, Ramotswa, Molepole, Lobatse and Mochudi.

4.2 The sample

A sample is an observed subset of population, which is supposed to represent that population²²⁰. A sample is a portion of the overall population that one wishes to study. It may be preferable to devote resources to subsets of the population in the hope that such a concentration of effort will produce more accurate measurements. The sampling process is a process of selecting a few (sample) from a bigger group (target population) to become the basis for estimating or predicting a fact, situation or outcome regarding the bigger group²²¹. Sampling theory guarantees good results regardless of the population size, provided the sample is bigger than 30 percent ($n > 30$) of the whole population, where n is the sample size.

4.3 Sampling technique

The sampling technique employed in this research, was the Random sampling technique. This technique involves the selection of elements from a population using random procedures, in which each element of the population has an equal and independent chance of being included²²². Under this technique, systematic sampling was used to select samples by following some rules set by the researcher, which involves selecting the K^{th} member where the random start is determined²²³.

The DRTS have got user records which were made available to the researcher. Of all the users of the VRLS the front desk officers and their supervisors were the ones specifically

²²⁰ Nalzaró (2012)

²²¹ Nalzaró (2012)

²²² Nalzaró (2012)

²²³ Nalzaró (2012)

selected for this particular study. The questionnaire was distributed to all front desk officers and at least one supervisor per office.

4.4 Sample size

The sample size for the study was 71 responses gathered out of the 101 who were targeted. This makes up approximately 70 percent of the population size. The nonresponses were mostly due to the extremely demanding work schedules that the front desk officers are subjected to. From the morning when they resume work there would already be queues of customers seeking services related to registering vehicles and renewing licenses; as a result there was hardly any free time left during the day as they even have to work through lunch at times, hence most of them could not fill out or finish and submit their questionnaires on time.

5 Data analysis and interpretation

The SPSS was the major tool used to analyse and present the data gathered. For this study, data collected was subjected to simple, descriptive statistics and complex multivariate analysis. Factor analysis was also employed. Factor analysis forms groups of variables that have strong correlations with one another. In addition chi-square tests were used to test the significance of variables and relationships. Tools such as graphs, pie charts and tables were also used.

6 Ethical considerations

6.1 Ethical approval and research permit

The researcher sought and was granted a formal approval for conducting this research from both the DRTS and the Stellenbosch University's research committee. This was done before the commencement of the data collection exercise so as to allow time for the response from the concerned parties.

6.2 Confidentiality

The researcher has made an undertaking to keep all sensitive personal information given by respondents confidential. Information given by respondents for the purposes of this research

was therefore kept confidential, except where express approval was given by the respondents. Names of respondents shall not be divulged except as aliases to protect respondents. The questionnaires had left the choice of whether to provide the names or not to the respondents.

6.3 Informed consent

Consent of respondents has also been sought as much as possible and the relevant authorities were informed wherever possible about the research. Participation was voluntary. Where information sought is not of sensitive nature consent was not sought. However this may not lead to unethical conduct since the researcher shall not divulge any information.

6.4 Provision of debriefing, counseling and additional information

The researcher has disclosed the purpose of this research in as far as it did not undermine the confidential status of other stakeholders. The respondents were debriefed by providing explanations and assurances that their identities would not be revealed without their consent. Opinion leaders would have been contacted for this purpose to allay any fears the respondents may be having about their need for confidentiality.

7 Pre-test or pilot study

Prior to using the questionnaire to collect data the questionnaire was pilot tested. The purpose of the test was to refine the questionnaire so that respondents would not have problems answering the actual (final) questions and recording the answers correctly. In addition this enabled the researcher to obtain assessment of the questions' validity and the extent of the reliability of data collected. A pretest was done with five participants randomly chosen from the researcher's colleagues to critique it. After pre-testing a refinement process was undertaken where there were any inconsistencies before producing the final questionnaire.

Chapter 5

Data Presentation and Analysis

1 Introduction

This chapter presents the findings from the fieldwork using the methodologies, participants, tools, approaches and procedures described in the previous chapters.

Findings about key variables, used to evaluate the efficiency and effectiveness of the VRLS system, specified by Delone and McLean's Model are presented. The Delone and McLean's 2003 IS Success Model specifications constitute the primary variables or independent variables for the research. The sub variables have been derived from these variables and tabulated to represent the variable frequency distribution for further data analysis purposes and decision-making.

Furthermore, these abstract variables as per Delone and McLean's Model, i.e. user satisfaction, system use, system quality, service quality, information quality and net benefits have undergone various statistical testing i.e. a cross tabulation in order to determine whether a relationship between these variables exists. For instance we could have a hypothesis that there is a relationship between system user satisfaction and service quality. If the value of the chi square test exceeds a certain defined threshold then one can conclude that if a system user is not trained for instance (service quality), there is bound to be a nil user satisfaction when utilizing the system.

In summary, the primary variables as specified by DeLone and McLean's IS Success model's derivative variables should enable the research to determine whether the VRLS implemented by DRTS is a success from the users' (front desk officers') point of view, as stated in the research problem statement in Chapter 1 and also answer subsequent research questions. Responses have been analyzed and their values noted. The acquired values have been presented in the tables, and illustrative histograms or pie charts have been used to enhance tabulated information for clarity and easier comprehension.

2 Data analysis and presentation

2.1 Demographic information for VRLS users (Questionnaire Part 1)

Table 1: Gender (Question 1)

Sex	Frequency	Percent %
Male	19	26.8
Female	52	73.2
Total	71	100

Table 1 highlights the general demographics of the sample. The survey was conducted with a composition of 19 males and 52 females. The ratio of males to females is almost 2 men to 5 females. The results of this survey may therefore be gender biased towards women considering the numbers of males and females in the survey.

Table 2: Age variation (Question 2)

Age	Frequency	Percent %
Below 25	2	2.8
26 – 35	39	54.9
36 – 45	28	39.4
46 – 55	2	2.8
Total	71	100

The survey was of mainly young adults i.e. the age group of 20 – 40 years. Most of the respondents were in the age group 26 – 45 years i.e. 67 people were in this age group and only 2 people were 52 years old and 2 under 25 years. The ages of the respondents shows that the people who are working with the VRLS are relatively young and should still be interested in learning new things and also explore new methods or ways of doing things. They should be quick to adjust to new conditions. Generally young adults are perceived to be acceptant and interested in changes and more willing to trying new things.

Table 3: Highest qualification (Question 3)

Highest Qualification	Frequency	Percent %
Secondary certificate	4	5.6
Diploma	20	28.2
Degree	20	28.2
Not applicable	18	25.4
Missing responses	9	12.7
Total	71	100

Considering the level of study of people using the VRLS, most people have studied up to some level. About 44 people have attained some form of formal education, the lowest being a secondary education and the highest a degree. However 18 respondents classified their study level as not applicable. This could have been a result of several factors. Some may have been in the process of completing a particular level of qualification, others may have failed to complete a course, whilst others faced financial constraints and some did not see the need in disclosing their educational level.

The rather high number of staff that did not have some form of formal education was a cause for concern as their lack of education might leave them ill-equipped to deal with the advances of technology, therefore hampering the effectiveness of the VRLS system as they might be resistant to fully utilize it.

2.2 System Use (Questionnaire Part 2)

Question 1- Indicate your user level in the VRL system

Figure 9: VRLS user levels

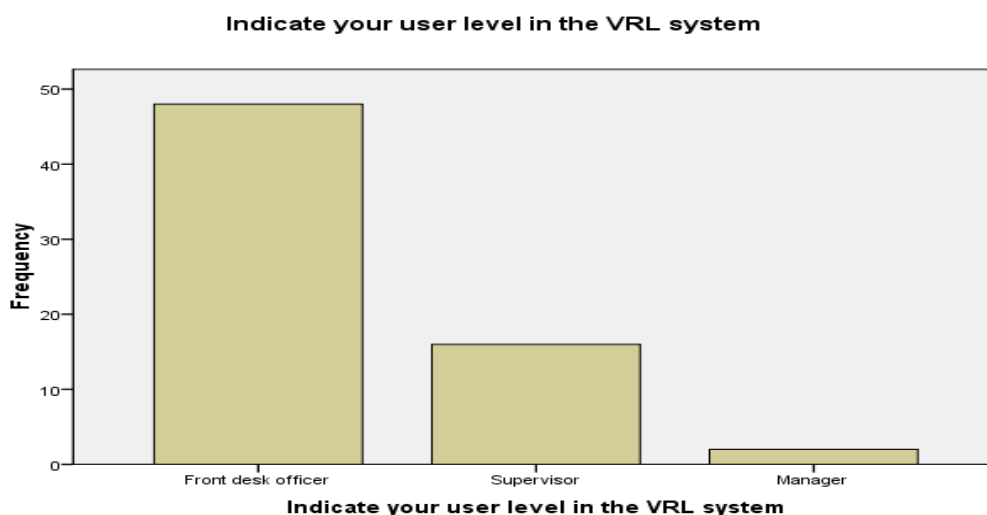


Table 4: VRLS user levels

	Frequency	Percent (%)
Front desk officer	48	67.6
Supervisor	16	22.5
Manager	2	2.8
Missing	5	7.0
Total	71	100

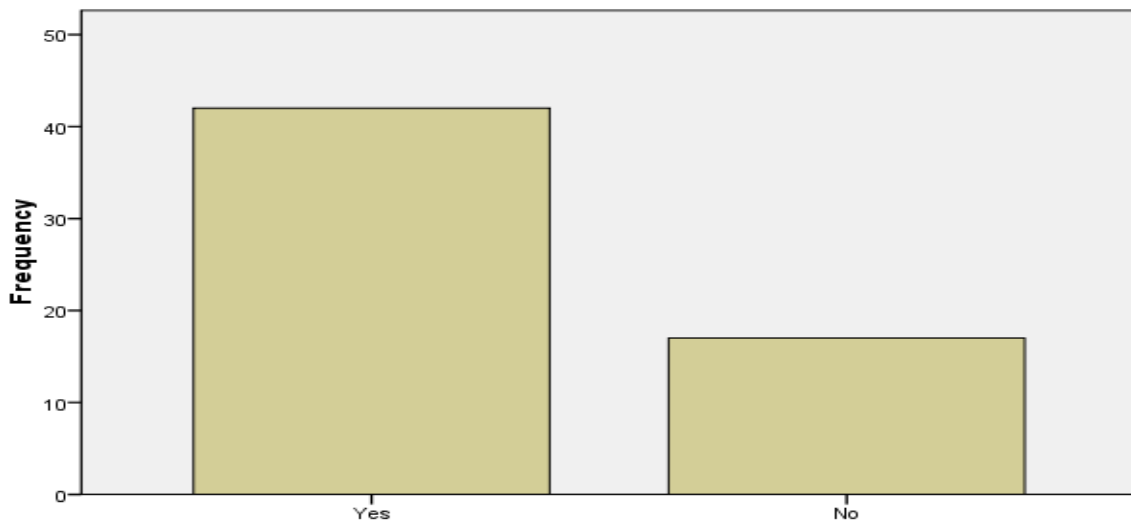
The VRLS is mostly used by the front desk officers making up 67% of the users, followed by supervisors, and then managers contributing only 3% of the users. This makes the front desk officers the main users of this system as they need to interact with it to assist members of the public with tasks relating to registering and licensing motor vehicles. This makes the front desk officers a more relevant group of users to provide insight on the various success factors of the VRLS.

Question 2- Is the VRLS available in all the DRTS offices around the country?

Table 5: VRLS availability

	Frequency	Percent (%)
Yes	42	59.2
No	17	23.9
Missing	12	16.9
Total	71	100

Figure 10: VRLS availability in DRTS offices across the country



When asked about the availability of the VRLS across the country 59.2% of the respondents agreed that it is available. However if the system is indeed available in all the offices, it is somewhat worrying that less than 60% can answer in the affirmative. It means that over 40% are not well informed about the availability of the system, therefore saying No or not responding at all. Missing responses might indicate that those respondents have not been in many other offices around the country; therefore they are not in a position to answer ‘Yes’ or ‘No’.

Question 3- Are you aware of the VRLS purpose of use at DRTS?*Table 6: Awareness of purpose of use*

	Frequency	Percent (%)
Strongly agree	25	35.2
Agree	30	42.3
Disagree	4	5.6
Strongly disagree	2	2.8
Missing	10	14.1%
Total	71	100%

Over 77% of the users are aware of the VRLS purpose which constitutes to most of the users. ‘Purpose of use’ according to Petter et.al²²⁴ is one of the sub-components which fall under the System Use dimension of the Delone & McLean IS success evaluation model. The users being aware of the purpose of use of a system will naturally use it more confidently and appropriately for its purpose. A significant number of missing responses may mean that some users were undecided or unaware of the VRLS’ purpose of use.

Question 4- What do you think is the utilization rate for the VRLS?*Table 7: VRLS Utilization rate*

	Frequency	Percent %
0 - 25%	4	5.6
26% - 50%	10	14.1
51% - 75%	33	46.5
76% - 100%	18	25.4
Missing responses	9	8.5
Total	71	100

²²⁴ Petter Delone & Mclean (2008), 239

Over 70% of the respondents report that VRLS is utilized between 51% and a 100%, which is a very high and satisfactory rate. This shows that the majority of the staff does use the VRLS system; which means the system has been accepted and is integrated into daily use by members of staff.

2.3 Net benefits (Questionnaire Part 3)

Question 1- In your own judgment is the VRLS worth the investment done?

Table 8: VRLS' investment's worthiness

	Frequency	Percent
Strongly agree	11	15.5
Agree	43	60.6
Disagree	5	7
Strongly disagree	4	5.6
Missing	8	11.3
Total	71	100

Most of the respondents, over 75% agree that the investment made on acquiring the VRLS was worth the money. In other words there are more positives over negatives that have impacted the work life of these respondents since the implementation of this system; hence they reckon it was worth every penny spent on it. The missing results could be attributed to those respondents who did not want to reveal their opinion on these matters.

Question 2- Was it worth the effort to automate the manual system of registration and licensing vehicles?

Table 9: VRLS automation worthiness

	Frequency	Percentage (%)
Strongly agree	32	45.1
Agree	22	31.0
Disagree	1	1.4
Strongly disagree	5	7
Missing	11	15.5
Total	71	100

Over 76% of the respondents agree and strongly agree that it was worth the effort to automate the VRLS. This also confirms a realized benefit of this automated system to the users. A relatively high number of missing responses could be attributed to the respondents who were technologically challenged, possibly because of their educational background, and hence are not able to appreciate the benefits of an automated system over a manual one.

Question 3- Have you realized any benefit in using the VRLS?

Table 10: VRLS net benefits realized

	Frequency	Percentage
Strongly agree	26	36.6%
Agree	33	46.5%
Disagree	3	4.2%
Strongly disagree	3	4.2%
Missing	6	8.5%
Total	71	100%

From table 10 above, a very high number of the respondents, over 83% confirm to have realized some form of benefit(s) in using the VRLS and only 8.4% have not. If the VRLS is reported to be beneficial by such a good number of respondents, it can then be interpreted that the users are not just utilizing this system because they have to, but it actually is of some value to them. The missing responses may be attributed to those respondents who do not grasp the benefit of an automated system over a manual one.

Question 4- What is the feedback from the public on the VRLS service delivery in your own opinion?

Table 11: Reaction of the Public to VRLS service delivery

	Frequency	Percent (%)
Poor	12	16.9
Fair	13	18.3
Good	27	38.0
Very Good	11	15.5
Excellent	1	1.4
Missing	7	9.9
Total	71	100

Table 11 shows that nearly 55% of the respondents report that the public view the VRLS service delivery as good and satisfactory. Since most of these users interact with the public on a daily basis to serve their needs, their feedback is quite key on whether the public believe they are benefiting from the services offered by this department through this system or not. The benefit is therefore not only realized by internal customers but external customers as well. The missing responses could result of those respondents who do not directly interact with the public as much, i.e. the supervisors and managers.

2.4 User Satisfaction (Questionnaire Part 4)

Question 1- Using the VRLS improves my work throughput

Table 12: VRLS improves work throughput

	Frequency	Percent (%)
Never	5	7.0
Sometimes	28	39.4
Almost always	12	16.9
Always	19	26.8
Missing	7	9.9
Total	71	10%

Table 12 shows that over 80% of the respondents confirm that the VRLS improves their work output in one way or another, reflecting some level of satisfaction in using this system. A relatively high number of respondents however report that the system improves their work throughput only sometimes, which means there are other times when this is not the case. This could be because of some discrepancies affecting the users' satisfaction, for instance system malfunctions, regular trainings in how to fully utilize the system for their benefits, or general support offered on the system. Missing responses could be from those respondents whose views are neutral on the subject.

Question 2- I am satisfied with using the VRLS to do my work

Table 13: Satisfied using VRLS

	Frequency	Percent (%)
Yes	40	56.3
No	26	36.6
Missing	5	7.1
Total	71	100

Figure 11: Satisfied using VRLS

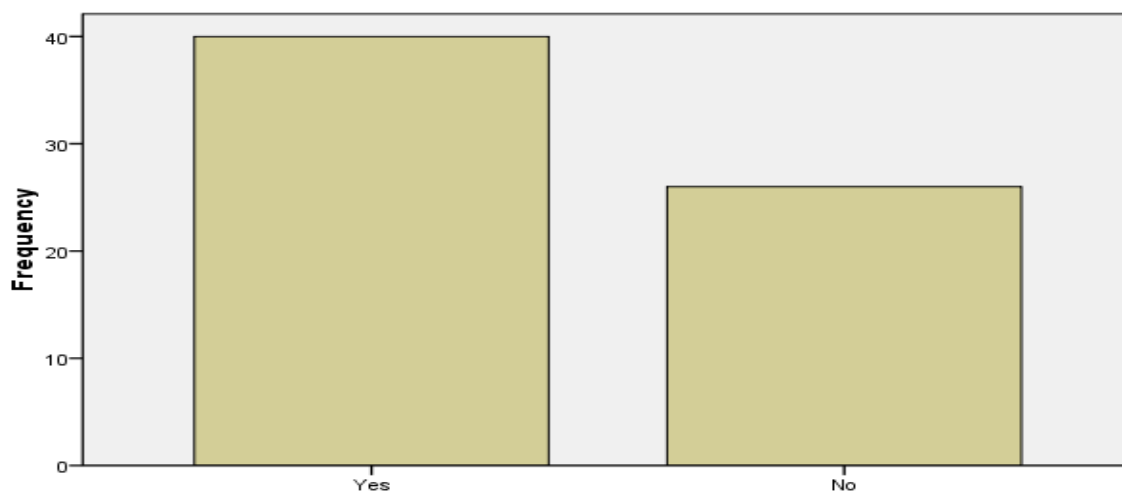


Table 13 and figure 11 above reflects that most of the respondents are generally satisfied with using the VRLS to do their work. A significant number of respondents who disagreed or did not respond however is a great concern, as they may be the same users who revealed they are not happy with the support and trainings they are given or are supposed to be given for this system.

Question 3- Does the VRLS make your work easier?

Table 14: VRLS making work easier

	Frequency	Percentage (%)
Strongly agree	26	36.6
Agree	33	46.5
Disagree	3	4.2
Strongly disagree	3	4.2
Missing	6	8.5
Total	71	100

Table 14 shows that over 80% of respondents confirm that they are content with VRLS in that it makes their work easier. This reflects a good level of success of an IS in aiding its users to fulfil their task as this would be the main purpose of an IS. The users disagreeing and

unresponsive may reflect some users who may still be struggling with utilizing this system to fully meet their work demands, which could reflect a need for some training on the system, or a fact finding campaign on how the users are finding general interaction with this system.

Question 4- VRLS is a user friendly system which alerts users of errors

Table 15: VRLS user friendly

	Frequency	Percent (%)
Always	11	15.5
Almost always	17	23.9
Sometimes	29	40.8
Never	9	12.7
Missing responses	5	7
Total	71	100

From table 15 above it shows that most of respondents are generally finding the VRLS user friendly especially in alerting the users of errors. The big concern however, is that around 40% of the users are satisfied only sometimes on this issue, which could mean there are other negative factors affecting their general approval of this system as user friendly in this regard. Further investigations therefore may need to be done to find out exactly what these factors could be.

The users disagreeing may be those still finding the VRLS to be complicated and not easy to use in one way or another. The missing responses may be from those users who may want their views to remain neutral on this issue.

Question 5- Do you think the VRLS would need additional functions to complement existing ones?

Table 16: VRLS needing additional functions

	Frequency	Percentage (%)
Strongly agree	17	23.9
Agree	39	54.9
Disagree	2	2.8
Strongly disagree	3	4.2
Missing	10	14.1
Total	71	100

Table 16 shows that 78% of the respondents agree that the system need additional functions to complement the existing ones, which reveals some good knowledge of the system by its users and the recommendations they may be having for further improvement. This also reveals the experience of the users with the system and the fact that even though they have revealed their general satisfaction with the system, there are still some areas of improvements required to increase its performance.

The users' in disagreement may be those who have not realized any essential areas of improvements to make this system even better. The missing responses may be from those users whose views are neutral on this issue.

2.5 Service Quality (Questionnaire Part 5)

Question 1- I have been trained to use the VRLS

Table 17: Trained to use the VRLS

	Frequency	Percentage (%)
Never	12	16.9
Sometimes	28	39.4
Almost always	14	19.7
Always	15	21.1
Missing	2	2.8
Total	71	100

Out of 69 people who responded to VRLS training for the system's use, 83% have agreed to have been somehow trained. However Within this 69 who have been trained, only 21% claimed they always received training whilst 40% claimed that training occurred only sometimes. The discrepancy as to how training is handled could be a fault of management or perhaps attributed to the educational and job level of the respondents.

Question 2- Rate the support rendered to VRLS users

Table 18: Rating of Support Rendered for VRLS Maintenance

Rating	Frequency	Percent
Poor	10	14.1
Fair	17	25.4
Good	33	49.3
Very Good	7	10.4
Missing	4	5.6
Total	71	100

Observing the results from table 18 above the general trend seems to follow that the VRLS has a decent amount of support with over 75% feeling the support rendered was fair, good and very good. The 10 respondents who rated the VRLS support as poor could be the ones who reported to have never received any form of training whatsoever. The missing responses may be the users undecided on rating of the support.

Question 3- Rate the time spent to react to a lodged complaint for a VRLS malfunction either hardware, software and networking

Table 19: *Response time taken to attend to reported system malfunctions*

Rating	Frequency	Percent
Poor	18	25.4
Fair	19	26.8
Good	23	32.4
Very Good	6	8.5
Excellent	1	1.4
Missing	4	5.6
Total	71	100

Most of the respondents; around 69% rates the time taken in response to the complaints lodged to the support unit as acceptable. There is a significant number of respondents however, who rated the response as poor. This is an issue to be taken seriously by both management and the support unit as both a complaint and an area needing improvement. Since this research covered areas surrounding Gaborone, and the department IT unit is based in Gaborone, this could also be what affects the time taken to respond to customer complaints lodged.

Question 4- Is there a specific support unit for VRLS or is it supported by the general DRTS IT unit?

Table 20: *Specific support department available for VRLS*

	Frequency	Percent (%)
Yes	18	25.4
No	30	42.3
Do not know	14	19.7
Missing	9	12.7
Totals	71	100

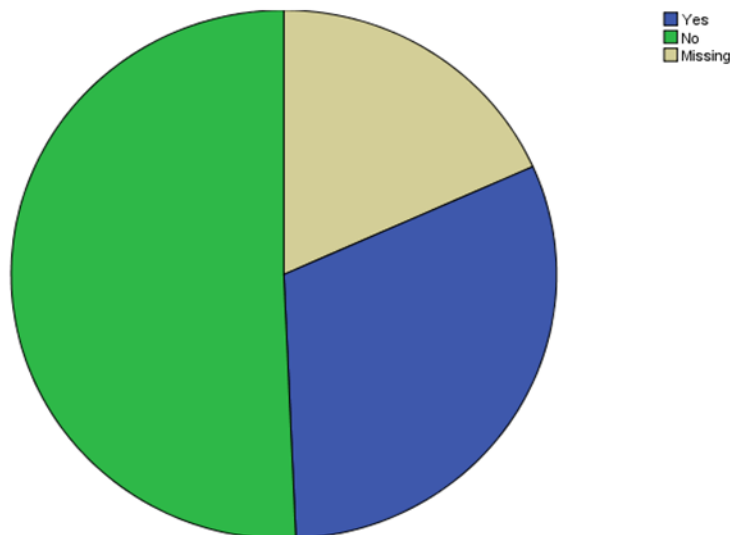
A startling 19.7% didn't know which department handled maintenance whilst another 25.4% thought there was a specific VRLS IT support department. According to DRTS management, VRLS support is handled by the general IT unit in the department, this shows that there is a high proportion of users who are confused or unaware of where to find assistance pertaining to the VRLS system. Further investigations could also unveil the reason behind those who chose to not disclose their views on this matter.

Question 5- The VRL system has a user manual available for users always

Table 21: *Manuals available for the VRLS system*

	Frequency	Percent (%)
Yes	22	31.0
No	36	50.7
Missing	13	18.3
Totals	71	100

Figure 13: *Manuals available for VRLS users always*



To further analyze the training aspect of the VRLS the respondents were asked if they knew of the existence of a VRLS user manual. A large number (62.1%) of the respondents answered that the VRLS system had no user manual in either electronic or physical form. This indicated a lack of communication or information gaps between VRLS implementers and final users, as according to DTRS a system manual was ready and available at all times. It could also have meant that most of the respondents were not privy to this information as it may have been deemed unnecessary for their level yet necessary for the IT department. This means that if the user manual surely exists something needs to be done to make it available to the users of the system for the sake of reference and enhancing of their understanding of the system.

Question 6- Are there any refresher courses conducted for the VRLS?

Table 22: Refresher courses available

	Frequency	Percentage (%)
Never	48	67.6
Sometimes	15	21.1
Almost always	3	4.2
Always	0	0
Missing	5	7
Total	71	100

A vast majority of the respondents stated that there were no refresher courses offered for the VRLS system as reflected by the 67.6% that respond with the answer never. This might indicate that training is a once off scenario and no follow-ups or update courses are undertaken. Refresher courses are very important as they help to evaluate how the users have understood the system; they help to correct some misunderstandings, misconceptions and mistakes made by the users.

The 21.1% and 4.2% of the respondents who are saying there are refresher courses available sometimes and almost-always could mean that only a few of them are trained and expected to assist the others because maybe the training is too expensive for the management to train all the users.

2.6 System Quality (Questionnaire part 6)

Question 1- The effectiveness of the VRLS technology is perfect

Table 23: Effectiveness of VRLS technology

	Frequency	Percentage (%)
Strongly agree	6	8.5
Agree	40	56.3
Disagree	15	21.1
Strongly disagree	3	4.2
Missing	7	9.9
Total	71	100

46 respondents agree and strongly agree to the fact that the effectiveness of the system's technology used is perfect. 18 disagree and strongly disagree with the perfection of the system's technology. To a greater extent the VRLS users accept the technology used in the system as well functioning. The 7 missing responses may be from the users who want to reserve their opinions on the VRLS technology or just do not know much about it.

Question 2- Have you ever noted any general VRLS functionality deficiency which could be important for the daily working tasks?

Figure 14: General VRLS functional deficiencies noted

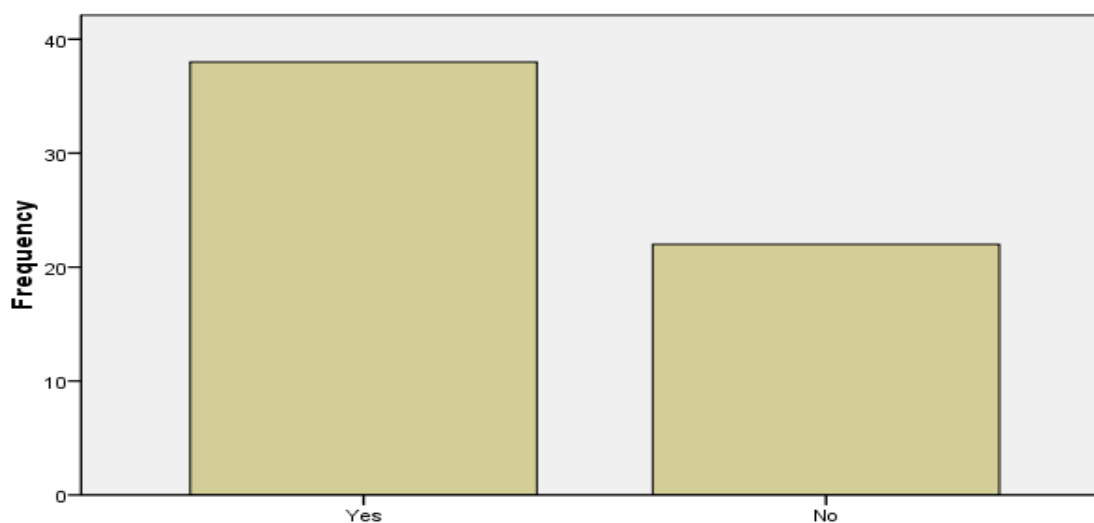


Table 24: General VRLS functional deficiencies noted

	Frequency	Percent (%)
Yes	38	53.5
No	22	31
Missing	11	15.5
Totals	71	100

A majority of the respondents have noted some functional deficiencies on the system, but a relatively high number have also reported to not have noticed any functional deficiencies on the system. This can be taken to explain that the system has some limitations, which sometimes affect the users' work.

The contrast in opinion might be a bit of concern as most of these users use the same system to perform similar functions while assisting customers; therefore it should either be the case of the system deficiencies being there or not. This differing opinions may mean that since some of the users have claimed to have never received any form of training on the system, they do not have the necessary knowledge to make the judgment on whether the system is performing as it should or not. The other reason could be from the fact that there are no user manuals readily available to the users, as the some respondents have reported, hence there is no reference for the users to confirm whether what may look like a deficiency is really that or not.

Question 3- How would you rate the VRLS availability on a given day?

Table 25: Daily VRLS availability

Rating	Frequency	Percent (%)
0% - 25%	6	8.5
26% - 50%	13	18.3
51% - 75%	26	36.6
76% - 100%	19	26.8
Missing	7	9.9
Total	71	100

The figures above indicate that most of the respondents agree that the VRLS is mostly up and running most of the time and its downtimes are quite low. A significant number of respondents (26.8%) however indicate that the system's availability on a given day is below 50% which raises some concern. But this can also be because of the fact that the users are only basing their judgments on estimations as they have not actually measured the availability of the system. The missing responses could also be because the respondents were undecided as they did not have the actual information of the exact numbers.

Question 4- Does the usage of the VRLS technology make a difference in your everyday work life?

Table 26: The use of VRLS technology making a difference in everyday work life

	Frequency	Percentage (%)
Strongly agree	8	11.3
Agree	40	56.3
Disagree	8	11.3
Strongly disagree	5	7
Missing	10	14.1
Total	71	100

Usage of VRLS technology makes a difference in the users' everyday work life to 67% of the respondents, hence approving the quality of the VRL system. A total of around 18% disagree and strongly disagree to the fact that VRLS technology makes a difference in their everyday work life. This shows that as much as the use of VRLS has a positive impact to a great extent to the everyday work life of most of the users, to some users this is not the case. This could be the same users who have reported to have not been happy with some of the things touching the system's support as well as the noted deficiencies in this system. In this instance there is also a relatively high number of missing responses i.e. 10 responses are missing.

Question 5- Indicate typical characteristics of the VRLS

Figure 15: VRLS Key Technological Characteristics

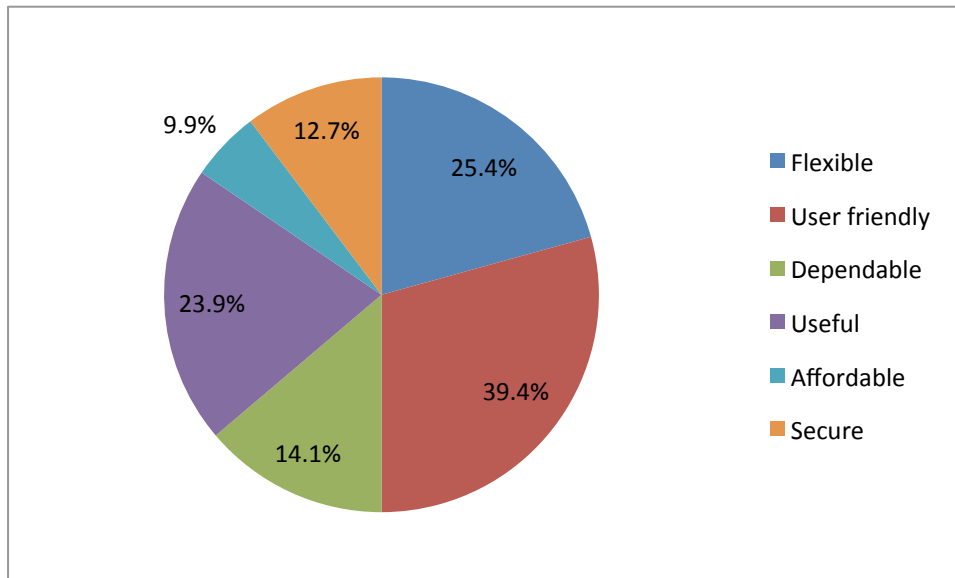


Table 27: Key VRLS technological characteristics

Variable	Frequency
Flexible	18
User Friendly	28
Dependable	10
Useful	17
Affordable	7
Secure	9

Figure 15 and table 27 above reflects some of the specific good qualities of the VRLS and the users regarded it as mainly user-friendly, then flexible, useful, dependable, secure and lastly affordable. The lower numbers on the affordability and security features of the system respectively may be explained by the fact that it is unlikely that the ordinary system users will be aware of the cost of the system, except for those in management positions, as well as the security of the system, except for those in the IT unit.

2.7 Information Quality (Questionnaire Part 7)

Question 1- The information captured through VRLS is reliable, timely and accurate

Table 28: VRLS information reliable, timely and accurate

	Frequency	Percentage (%)
Strongly agree	21	29.6
Agree	38	53.5
Disagree	3	4.2
Strongly disagree	3	4.2
Missing	6	8.5
Total	71	100

A very high number of respondents, over 83%, agree and strongly agree that the information captured by the system is reliable, timely and accurate. This shows that most people approve of the information quality of this system and they depend on it. Trusting and depending on the system indicate that the users are satisfied to a greater extent by the system. The missing responses may mean these users are unsure of the VRLS information quality.

Question 2- VRLS is very effective in the retrieval, processing and storage of data

Table 29: VRLS data retrieval, processing and storage effective

	Frequency	Percentage (%)
Strongly agree	33	46.5
Agree	29	40.8
Disagree	1	1.4
Strongly disagree	2	2.8
Missing	6	8.5
Total	71	100

The results of the information quality are reflected in table 29 above, with over 87% of the participants confirming that the VRLS is effective in retrieval, processing and storage of the data and only 4% disagreeing. This highlights that the system is able to capture and relay a high standard of information and the users are satisfied in this regard. The missing responses may again be unsure about this quality of the VRLS.

Question 3- Tick all possible benefits noted from the information produced from the VRLS

Table 30: VRLS information's benefits

Variable	Frequency
Availability Of Key Information At Instance	29
Reduced Paper Work	45
Easy Decision Making	14
Easy Managing Of Daily Workload	28
Easy To Understand	26

The results reflected above on table 30 show that to a great extent the system has some specific benefits realized from the information it produces. To a greater extent the system has reduced paper work as confirmed by 45 respondents, followed by 29 saying that the system allows for availability of key information at an instance, then 28 saying that the information from the system makes it easy to manage daily workload, and 14 saying that the information produced by the system helps in decision making.

3 User Satisfaction and Net Benefits Cross Tabulation

The relationship between user satisfaction and net benefits realized at DRTS is analyzed with a cross tabulation. Whether satisfied users will admit to having realized the net benefit of an IS, hence attributing its success and acceptance. The two components selected are 'Using VRL system improves my work throughput (user satisfaction) and 'In your own judgments is the VRLS worth the investment done' (Net benefit)

Table 31: Cross tabulation comparison - *Using VRL system improves my work throughput* * *In your own judgments is the VRLS worth the investment done*

Using VRL system improves my work throughput	In your own judgments is the VRLS worth the investment done				Total
	Strongly agree	Agree	Disagree	Strongly Disagree	
Never	1	0	1	2	4
Sometimes	4	19	2	1	26
Almost always	1	10	1	0	12
Always	4	12	1	1	18
Total	10	41	5	4	60

Table 32: *Chi-Square Test*

Chi- Square Test:	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.170a	9	0.033
Likelihood Ratio	14.674	9	0.1
Linear-by-Linear Association	2.307	1	0.129
N of Valid Cases	60		

The Chi- Square Test tries to find if there is a relationship between the cross tabulations. The null hypothesis in this instance would be that there is no relationship between the system improving ones work (user satisfaction) and the worthiness of the VRLS (net benefit). A P-value of 0.033 show that there is some significant relationship between ‘Using VRL system improves my work throughput’ and ‘in your own judgment is the VRLS worth the investment done’.

The researcher can say that the system improves the way that the users execute their duties or work thus leading to the conclusion that the system was worth the investment done. This confirms that the system’s user satisfaction play a role in it being valued and accepted as successful because its benefits have been fully realized by the system’s users.

4 Discussions of Results

In this section results obtained from the research are discussed. The relationships between efficiency and effectiveness of the VRLS system and various primary and derivative variables are taken into account. These variables were taken from the DeLone and McLean Model's Information System specifications. From this model the issues which impact on VRLS effectiveness and efficiency such as user satisfaction, system utilization, system services, and system quality and system acceptance are considered.

- a) User satisfaction, system utilization and acceptance have impacted on the VRLS being appreciated as a relevant and vital information system to replace the previous manual system. Therefore it has a very significant impact. The attitude of the users on the VRLS utilization is in high levels. The users' positive attitude to a greater extent leads to high system utilization.
- b) System manuals also form a continuous way of enhancing the user's knowledge of the system through self-directed study. It was observed in the study that the VRLS manuals, be it in electronic or physical form, are hard to find, hence deterring the process of enhancing self-study to understand the system. Lack of self-studying material leads to lack of knowledge on key technologies used to implement the system, besides simply understanding how the system works.
- c) Although some training have been conducted on the VRLS users, the frequency of this training and the availability of refresher courses for both old and new staff have been very scarce, as indicated in the results. A large number of people saying refresher courses have never been conducted may indicate that there is a serious need to increase the frequency of training the users. Training through refresher courses can help to strengthen the confidence and skills of the users, thus ensuring user satisfaction and in turn high levels of system utilization. Refresher courses also cater for disseminating new information or functionalities updated on the system.

Almost 60% of the respondents are saying that there have been some changes made to the system functionalities, therefore further training should have been provided on these

additions. User training for the system is not done fully and some users have not been provided with user training manuals. This may have caused some system users to view negatively the utilization and benefit of the VRLS, hence the considerable number of neutral responses observed.

- d) In general, VRLS users are aware of the system, 85% have noted the benefits of using the system to do their work. Showing that user felt it was important for the vehicle registration process to have migrated from the manual process to the automated process currently in use. The system has also been seen as simple and user friendly enough. This shows a huge and great potential of utilization and satisfaction of adopting the VRLS.
- e) VRLS users indicated that the system assisted and improved their daily work processes, which shows a greater level of acceptance of this system, which is an indicator of the VRLS efficiency in doing the intended task. Furthermore another 56% are satisfied with the results of using the system in achieving their key performance areas. However there did seem to be a feeling that although the system adequately covered the working operations there was room for much more improvement.
- f) VRLS functionalities are adequate enough to support the key performance areas of the user's tasks and the support and maintenance rendered to VRLS makes it available. More training may have boosted their confidence in exploring the system's functionalities further.
- g) There is a meaningful satisfaction with the system in terms of system operation, stability, quality, service and availability. These factors enhance user perception and behaviour towards the system's utilization, appreciation and acceptance.

Chapter 6

Conclusion and recommendations

1 Introduction

This chapter discusses the findings shown in chapter 5 and explains the results indicated in the findings. It explains the meaning and implications behind the findings and tries to clarify the reasons behind the findings. The discussion section generally puts the findings into clearer perspective of the impact of user satisfaction and acceptance of VRLS information system, hence the efficiency and effectiveness of VRLS. In this chapter conclusions are reached considering discussions of findings in Chapter 5. The conclusion section shall be brief and to the point stating the conclusion of the findings drawn from the results.

The recommendations which follow the conclusions shall firstly assist the Department of Transport and Communication executives to make informed decisions of whether it is beneficial to continue using the current system or to upgrade and also unveil the net benefits associated with the use of VRLS. The further recommendations given will contribute towards the Information System Success Evaluation Body of Knowledge on the process of evaluating information systems in order to determine their effectiveness. These recommendations will apply the empirical evidence in explaining and predicating parameters that can influence the effective utilization of an information system in an organization, and also the use of appropriate information system evaluation models for productive platforms like the transportation industry.

2 Problem statement and methodology

This study was centred on the Vehicle Registration & Licensing system(VRLS) deployed by the Department of Road Transport & Safety (DRTS) of the Ministry of Transport and Communication (MTC) of Botswana government. The main issue that incited this study was

the fact that despite the millions of Pulas²²⁵ that has gone into the acquisition and implementation of this information system, there has not been any proper evaluation done to assess and validate that this venture was good money spent.

The researcher took the initiative of applying a suitable success evaluation Information System model, to investigate the effectiveness of the VRLS at the DRTS, specifically from the system users' point of view. After the consideration and gauging of different Information System success evaluation models, the Delone & McLean proved to be the suitable candidate.

3 Summary of results

Respondents were both male and female. The questionnaire was given to 101 persons over a month with an excellent response rate of 70%. Most employees were generally young women, in their thirties. Most showed enthusiasm to learn. The majority had a very good educational level of diploma and above. Results indicated a positive attitude towards the VRLS with regard to System Quality, Information Quality, Use, User satisfaction and benefits. A few negatives have been reported on the Service Quality of this system. Below is a summarised presentation of the results based on these dimensions and their sub-components. Instead of the specific results an indication is given whether the general trend of the responses is positive, neutral or negative.

3.1 System Quality

Overall the front desk officers approve that in a given day, the VRLS is up and running most of the time, is reliable and also agree that VRLS has got key information available for them instantly; therefore it can be said to be a reliable system. The users also admit that the technology used in the VRLS is effectively perfect, hence implying a positive overall system quality.

²²⁵ Botswana currency

A significant number of users however noted some general functionality deficiency on the VRLS, which could imply a need for this system to be improved, taking into consideration views and recommendations of its daily users. This augments the importance of the relationship between the Support Unit of the DRTS and the front desk officers, as there is a need for them to find out what these deficiencies are, in working towards improving the service quality of this system.

Table 33 Summary of the users' perception of the VRLS system quality

Component	Users' opinion
Ease of use	Positive
Flexibility	Positive
Response time	Positive
Reliability	Positive
System Quality	Positive

3.2 Information Quality

The majority of front desk officers supported the fact that information obtained from and produced by the VRLS was reliable, timely and accurate. The information quality of the VRLS is therefore positive.

Table 34 Summary of the users' perception of the VRLS' information quality

Component	Users' opinion
Reliable	Positive
Timely	Positive
Accurate	Positive
Information Quality	Positive

3.3 Service Quality

Generally most users are happy with the training given for the VRLS. There is however a significant number of users who stated they never received training on VRLS usage. This inconsistency had been highlighted by some DRTS offices that stated they were unhappy with the training arrangements set by the Support department as they had either never received any training, or a large period of time had elapsed before further training had commenced. These respondents, although a small number, should not be ignored therefore, because by so doing the service quality of the VRLS is subsequently compromised. This observation is supported by the high number of respondents that reported the lack of access to user manuals.

The user's understanding of the system will be obscured by not having a user manual to refer to. A high number of respondents also state that they never get refresher courses on the system, although the Support unit and the respondents have clearly revealed that there have been modifications on this system.

A significant number of users also relayed that responsiveness of the Support Unit to escalated requests is poor and unsatisfactory, also compromising the empathy sub-dimension. The results indicate that despite users reporting issues relating to the VRLS in one way or another, the response from the Support unit is not always satisfactory. In this regard it can be concluded that the support for this system is inconsistent and quite insufficient.

Table 35 Summary of the users' perception of the VRLS' service quality

Component	Users' opinion
Understanding	negative
Training	Positive
Support	Negative
Responsiveness	Negative
Empathy	Negative
Service Quality	Negative

3.4 User Satisfaction

In general the VRLS users' attitude and feelings towards the system are more on the positive side as they admit to issues like that the system aids them to register and license vehicles, is easy to understand, provides easy managing of daily workload, and has reduced paper work, which implies a positive experience and impact in using this system. The users also supports that the system is useful and dependable.

A great concern however, is a large number of users who responded that they were satisfied only 'some of the time' with some of the functions of the VRLS like user friendliness in alerting the user of errors and improving their work throughput. It implies that the users' attitudes and feelings are neutral in this regard, which significantly compromises the general satisfaction of these users concerning the impact of this system. User-friendliness and improved work-throughput (output) are very important aspects of user satisfaction and contributes essentially to the success of an IS, and therefore should be given the relevant attention if they are considered inadequate by any system stakeholder.

Table 36 Summary of the users' perception of the VRLS' user satisfaction

Component	Users' opinion
Attitude	neutral
Feelings	neutral
Perceived usefulness	Positive
Experience in using	Positive
Potential impact	Positive
User Satisfaction	Positive

3.5 System Use

The respondents concurred that the system is available for use in all DRTS offices distributed around the country and is actually being utilized. VRLS has got a higher number of users being the front desk officers as the main system users as reflected in the results when

respondents were asked to indicate their user level on the system. A larger number also have acquired higher level of education, i.e. Diploma and Degree, therefore appropriateness of use and the individual's knowledge is positive.

Table 37 Summary of the users' perception of the VRLS' system use

Component	Users' opinion
Utilization	Positive
Level of use and training	Positive
Appropriateness of use	Positive
Individual knowledge and believe	Positive
System Use	Positive

3.6 Net Benefits

A large number of the respondents acknowledging that the investment done in implementing this system was worth the effort signify a realized net benefit by these individuals. A satisfactory number of front desk officers appreciated the presence of the system, and agreed to it having played a positive role in their lives at this organization in one way or another.

The front desk officers, as they directly interact with the public, i.e. external clients, also communicated that there was a positive reaction from the public to the service delivery of the VRLS. A significant number of respondents who reported that there was a negative reaction from the public on the VRLS service delivery should be taken into consideration. The Support unit needs to provide a platform for the complaints and views of the public, in order to avoid compromised service quality which can directly affect the success of an IS.

Table 38 Summary of the users' perception of the VRLS' net benefits

Component	Users' opinion
Extent to which IS contributes to the success of individuals, groups, organisations, industries, nations for example	Positive
Improved decision making	Positive
Consumer welfare	Positive
Net Benefits	Positive

4 Conclusions

The findings thus far have given a clear indication of the effectiveness of the VRLS at DRTS from the users' point of view. The main aim and objective of this study has therefore been successfully met as it has been unveiled that the users of the VRLS, specifically the front desk officers, have accepted the VRLS and are satisfied with the technology embedded in this system. The successful evaluation of the VRLS using the Delone & McLean IS success model through the mode of a structured questionnaire establishes the VRLS at DRTS as a success.

The research has unveiled that the VRLS has made such tremendous impact on bringing to success the vehicle registration in Botswana. This notion is backed up by the positive outcome on most of the dimensions of the selected IS evaluation success model acknowledged by the VRLS end users. These users acknowledged that they can easily realize their key performance areas, and they have realized a substantial improvement of their work for the period of operation of this system. In conclusion this is a commendable effort for the management of DRTS to invest in such a system, which has been acknowledged by its end users as a necessary tool in their daily work.

The positive response in favor of this information system from the findings made has given the researcher a reason not to accept the initially proposed hypothesis, which has been proven wrong, but instead accept the alternative, asserting to the view that the VRLS is successful as an IS and is serving its purpose well, from the front-desk officers' point of view, who are the predominant users of this system.

The Government of Botswana's Ministry of Transport and Communication can also be assured from these findings that their decision to invest in the VRLS was a quality one and they have realized some non-monetary but equally important benefits as discussed. The following specifically highlights the recommendations derived from the findings made from this research.

5 Recommendations

This section gives the recommendations derived from the conclusions stated above. The recommendations divulge the key benefit yielded by the evaluation conducted through this study as per the requirements of the Delone and Mclean 2003 IS evaluation success model. The recommendations also dwell on what needs to be avoided or embarked on going forward in order to ensure an effective and efficient Information System in an organization.

1. In the context of the support for VRLS, it is clearly noted that training on the use of VRLS is not done as often as is required by the users. The user manuals are also not easily accessible, although changes to update the system have been done to suit current requirements. The research recommends that training for the user should be conducted more frequently, and this may be a way to enhance the current user satisfaction. Refresher courses are also a means of training, which could address the provision of system updates to the end users.

2. Some VRLS users have mixed feelings with regard to the general satisfaction of the system. As much as the system is accepted by many users, those who do not accept cannot be ignored as they contribute to the system's total efficiency and effectiveness. The research recommends DRTS management to embark on some serious investigations what exactly the

users are not satisfied with and what can be done about it. A platform should also be provided for the external clients' (public) views and any complaints they may have, so that any necessary improvements can be made to increase general satisfaction of their clients.

3. Information Systems have three critical elements, which are Information Technology, the people's activities using that technology to support the organization's operations and the organization itself. It has been noted that VRLS system users have found some functionality deficiencies in the VRLS functionality and have informed the relevant offices about these deficiencies. However what is not clear is whether the deficiencies have been corrected as the users have not been given the relevant feedback on the changes made. This suggested a problem in the communication between the maintainers of VRLS and its users. The research therefore recommends that DRTS should implement conventional mechanisms through which VRLS users' report concerning the system deficiencies should be adopted and implemented.

4. The research also recommends that further studies be conducted in this area of evaluating the success of Information Systems, especially assessing Government Transport Systems using the Delone & McLean IS evaluation as it proved very difficult to find information (research materials) in this area. The researcher believes that further findings perused from these findings will be very helpful to other? Government bodies as well.

6 Contribution of the research to the IS success evaluation body of knowledge

Although the Delone and McLean IS success evaluation model has been used in different situations, to the knowledge of the researcher this model has never been used to evaluate a Vehicle Registration & Licensing system in a Transport Department before. This study will therefore contribute towards increasing the knowledge that has been there on the application of this model by bringing the new dimension of evaluating the success of especially government investments on Transport systems, especially the Vehicle Registration and Licensing ones.

This study cements the success of the Delone & McLean 2003 IS evaluation model and its ability to facilitate the exploration of different aspects of an Information System, namely System, Information and Service Quality and their relationship with key parts of an organization, namely System Use, User Satisfaction and Net Benefits. The importance of recognizing the system user as a key stakeholder in the System Implementation and Maintenance stages of the System Development Life Cycle, as well as their contribution in determining whether an Information System implementation was a success or not, was also boosted in this research.

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Appendix

Appendix 1: Application Requirements for Registering a Vehicle²²⁶

- Police Clearance Certificate obtained from CID
- Certificate of roadworthiness obtained from DRTS vehicle testing station for:
 - Vehicles 3 years old and above
 - All re-imported vehicles
 - Homemade trailers (obtain chassis number from DRTS before Police Clearance and Road Worthiness testing)
- Identity of the Owner
- Omang for citizens
- Residence permit / exemption certificate and passport for non-citizens
- Certificate of incorporation for companies
- Certificate of registration for societies
- Parastatal number for Parastatal
- Guardians' ID for a minor (under 16)
- Diplomats should obtain an additional clearance from Ministry of foreign Affairs and International Co-operation.
- Application form for registration (RV 1) to be filled after all the above requirements is met.

²²⁶ Botswana Innovation Hub, (2009), Support Sections- Application Requirements for registering a vehicle

Appendix 2: Vehicle License Renewal²²⁷

- Registration book or Owner with his/her ID
- Roadworthiness certificate for vehicles with a gross vehicle mass (GVM) greater than 3500kg
- The required fee
- Customers are encouraged to renew their vehicle licenses 3 months before expiry to avoid month end congestion.
- A license exemption may be granted when the director of road transport is satisfied by the written proof that a vehicle will be off the road for a specified period. Form NTC 30 is used to request for vehicle license exemption
- Roadworthiness Testing
- Bring registration book
- Complete application for vehicle roadworthiness examination (DRTS 12)
- Pay the required fee
- Take your vehicle to vehicle testing station.

²²⁷ Botswana Innovation Hub, (2009), Support Sections- Vehicle license renewal

Appendix 3: Requirements for Registering Government Vehicles²²⁸

- Customs Clearance Certificate CE 109 issued by Department of Customs and Excise
- Police Clearance Certificate obtained from CID
- Certificate of Road Worthiness obtained from DRTS Vehicle Testing Station for:
 - Vehicles 3 years old and above
 - Homemade Trailers (Obtain chassis number from DRTS before Police Clearance and Road worthiness testing)

²²⁸ Botswana Innovation Hub, (2009), Support Sections, Requirements for registering government vehicles

Appendix 4: All re-imported vehicles²²⁹

- Identity of the owner (Acceptable identities are:)
- Omang for citizens
- Residence Permit/Exemption Certificate or Passport for non-citizens
- Certificate of Incorporation for companies
- Society Number for societies
- Parastatal Number for Parastatal organisations
- Guardian(s) ID for a Minor (less than 16 years).
- CTO/BDF auctioned or sold vehicles a letter from the respective organization should be obtained and vehicle registration book stamped.
- Diplomats should obtain an additional clearance from Ministry of foreign Affairs an International Co-operation.
- Application form for registration (RV 1) to be filled after all the above requirements are met.

²²⁹ Botswana Innovation Hub, (2009), Support Sections, All re-imported vehicles

Appendix 5: How to Obtain a Botswana Driving License?²³⁰

- Complete form DL1 and provide your ID omang/ passport and resident permit for expatriates.
- Pay and book for a theory test (fee P40.00)
- After passing your theory test, undergo eye screening and apply for a provisional (learners) license. (fee P30.00)
- Proceed to practice for your practical driving test with your instructor.
- When ready pay for your practical driving test and book for your yard test (Fee P40.00) if you pass your yard test you can proceed to book for your road test.
- Provide your valid driving test results and eye screening results and pay for your driving license (fee P70.00).
- Your driving license card is valid for five years from the month of issue. Note that if you fail any part of your driving test you will have to pay and re-do such test. Also if any test expires before you complete your driving test cycle you will have to pay and retake the test before you can proceed to the next stage. Each test result is valid for one year from the test date.
- Driving License Renewal
- Bring expiring license and your ID (Omang for citizens and passport for expatriates)
- Complete DL1 form and undergo eye screening.

²³⁰ Botswana Innovation Hub, (2009), Support Sections- How to obtain a Botswana license

Appendix 6: Driving License Classes²³¹

Driving License Class	Weight Description- GVM (Kg)		Minimum age	Requisite classes
	Vehicle	Trailer		
A1	Motorcycle less than 125cc but less than or equal to 230kg		18	None
A	Motorcycle greater than 125cc and 230kg		18	None
B	less than or equal to 3500	less than or equal to 750	18	None
EB	less than or equal to 3500	greater than 750	18	Class B held for 2 years or more
C1	greater than 3500 but less or equal to 16000	less than or equal to 750	21	
C	greater than 16000	less than or equal to 750	21	
EC1	greater than 3500 but less or equal to 16000	greater than 750	21	
EC	greater than 16000	greater than 750	21	
F	Tractors for agriculture purposes		16	
H	Special Mechanical equipment		18	None

²³¹ Botswana Innovation Hub, (2009), Support Sections- Driving license

Appendix 7: Application Requirements for Obtaining a Botswana License against a Foreign License²³²

Fill in DL 1 which is the main application form

- Undergo eye screening test
- Original foreign driving license containing a photo and class B held for at least 2 years for applicants holding Class C1 and above.
- Confirmation letter from driving license issuing authority directly or (via) respective High Commission/ Embassy. Official translation into English (if applicable)
- Provide proof that the applicant had stayed a minimum of 185 consecutive days in the issuing country Provide residence permit with a certified copy by the immigration department.
- Provide passport with a copy showing photo validity and proof of:
- Entry and/or exit of citizens and residents
- Study or work permit for non-citizens in the issuing country of the license
- Those aged above 65 years and above should provide medical certificate

232 Botswana Innovation Hub, (2009), Support Sections Application Requirements for Obtaining a Botswana License against a Foreign License

Appendix 8: Roles and responsibilities of the DRTS

As a Road Transport Authority, the DRTS is responsible for²³³ registration and licensing of vehicles, promoting road safety through public education, enforcing vehicle roadworthiness standards and road network audits to reduce crashes, save lives and reduce injuries and related pain, testing and licensing and registering drivers, training and licensing driving instructors, registering and inspecting driving schools, Inspecting vehicles for roadworthiness, authorizing and controlling public passenger and freight transport vehicles, maintaining an effective, reliable and secure information system for data storage and retrieval in respect of motor vehicles, driver licenses, transport permits, accidents, etc.

²³³ Botswana Innovation Hub, (2009), Support Sections-Roles and responsibilities of DRTS

Appendix 9: Structured questionnaire

VEHICLE REGISTRATION AND LICENSE SYSTEM INTERVIEW QUESTIONS

Prepared by

L. Laletsang

DATE: 15 July 2012

This questionnaire is based on study, which evaluates the success of the Vehicle Registration and Licensing System (VRLS) used to register and license motor vehicles. Please assist by taking part in responding to them. Any information provided would be treated confidentially hence feel free to participate. Thank you for the cooperation.

No.	PART 1: GENERAL PERSONAL INFORMATION <i>Please tell us a little about yourself</i> Please mark only ONE option per question below.		PART 2: VRLS USE
1.	Your gender <input type="checkbox"/> Male <input type="checkbox"/> Female	1.	Indicate your user level in the VRL system <input type="checkbox"/> Front Desk Officer <input type="checkbox"/> Supervisor <input type="checkbox"/> Manager <input type="checkbox"/> Support (Technician, Programmer, Analyst, Soft eng...etc)
2.	Your age category <input type="checkbox"/> Below 25 years <input type="checkbox"/> 26 – 35 years <input type="checkbox"/> 36 – 45 years <input type="checkbox"/> 46 – 55 years <input type="checkbox"/> Above 56 years	2.	Is the VRLS available in all DRTS offices around the country <input type="checkbox"/> Yes <input type="checkbox"/> No

3.	Indicate your highest educational qualification attained <input type="checkbox"/> Secondary certificate <input type="checkbox"/> Diploma <input type="checkbox"/> Degree <input type="checkbox"/> Not applicable	3.	Are you aware of the VRLS purpose of use at DRTS <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree
		4.	What do you think is the utilisation rate for the VRLS <input type="checkbox"/> 0 - 25% <input type="checkbox"/> 26% - 50% <input type="checkbox"/> 51% - 75% <input type="checkbox"/> 76% - 100%
PART 3: NET BENEFITS		PART 4 - USER SATISFACTION	
1.	In your own judgment is the VRLS worth the investment done? <input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Agree <input type="checkbox"/> Strongly Agree	1.	Using the VRLS improves my work throughput? <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Almost Always <input type="checkbox"/> Always
2.	Was it worth the effort to automate the manual system of registering and licensing vehicles <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree	2.	I am satisfied with using VRLS to do my work <input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Have you realized any benefit in using the VRLS? <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree	3.	Does the VRLS make your work easy? <input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Agree <input type="checkbox"/> Strongly Agree
4.	What is the feedback from the public on the VRLS service delivery in your own opinion? <input type="checkbox"/> Poor <input type="checkbox"/> Fair <input type="checkbox"/> Good <input type="checkbox"/> Very Good <input type="checkbox"/> Excellent	4.	The VRLS is a user friendly system which alerts users of errors <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Almost Always <input type="checkbox"/> Almost Always

		5.	Do you think the VRLS would need additional functions to complement existing ones? <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Agree <input type="checkbox"/> Strongly Agree
	PART 5 - SERVICE QUALITY		PART 6 - SYSTEM QUALITY
1.	I have been trained to use the VRL system <input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Almost Always <input type="checkbox"/> Always	1.	The effectiveness of the VRLS technology is perfect <input type="checkbox"/> Strongly disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Agree <input type="checkbox"/> Strongly Agree
2.	Rate the support rendered to VRLS users <input type="checkbox"/> Poor <input type="checkbox"/> Fair <input type="checkbox"/> Good <input type="checkbox"/> Very Good <input type="checkbox"/> Excellent	2.	Have you ever noted any general VRLS functionality deficiency which could be important for the daily working tasks <input type="checkbox"/> Yes <input type="checkbox"/> No
3.	Rate the time spent to react to a lodged complain for an VRLS malfunction both hardware, software and networking <input type="checkbox"/> Poor <input type="checkbox"/> Fair <input type="checkbox"/> Good <input type="checkbox"/> Very Good <input type="checkbox"/> Excellent	3.	How would you rate VRLS's availability on a given day? <input type="checkbox"/> 0 - 25% <input type="checkbox"/> 26% - 50% <input type="checkbox"/> 51% - 75% <input type="checkbox"/> 76% - 100%
4.	Is there a specific support unit for VRLS or is it supported by the general DRTS IT unit <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Do not know	4.	Does the usage of VRLS technology make a difference in your everyday work life? <input type="checkbox"/> Strongly Disagree <input type="checkbox"/> Disagree <input type="checkbox"/> Agree <input type="checkbox"/> Strongly Agree
5.	The VRL system has a user manual available for users always <input type="checkbox"/> No <input type="checkbox"/> Yes	5.	Indicate typical characteristics of the VRLS? <input type="checkbox"/> Flexible <input type="checkbox"/> User Friendly <input type="checkbox"/> Dependable <input type="checkbox"/> Useful <input type="checkbox"/> Affordable <input type="checkbox"/> Secure

6.	<p>Are there any refresher courses conducted for the VRLS</p> <p><input type="checkbox"/> Never <input type="checkbox"/> Sometimes <input type="checkbox"/> Almost Always <input type="checkbox"/> Always</p>		
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PART 7 - INFORMATION QUALITY			
1.	<p>The information captured through VRLS is reliable, timely and accurate</p> <p><input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree</p>		
2.	<p>VRLS is very effective in the retrieval, processing and storage of data</p> <p><input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree</p>		
3	<p>Tick all possible benefits noted from the information produced from the VRLS</p> <p><input type="checkbox"/> Availability of key information <input type="checkbox"/> Reduced paper work <input type="checkbox"/> Easy decision making <input type="checkbox"/> Easy managing of daily work load <input type="checkbox"/> Easy to understand</p>		

