

Are You Open Yet?

Use of Open Source Software in Libraries in Trinidad and Tobago: An Exploratory Study

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SUMMARY

The principle aim of this study is to investigate the state of adoption of open source software (OSS) in libraries in Trinidad and Tobago. It seeks to answer questions pertaining to the extent of use of OSS, the benefits or advantages of using OSS generally and in the Trinidad and Tobago context and the key issues related to the adoption of OSS generally and as it relates to the Trinidad and Tobago environment. Another area of enquiry is the level of awareness, interest and attitudes toward the value of adopting OSS among library and information professionals in Trinidad and Tobago.

A mixed methods approach was adopted for the research and the findings are based on data collected using two research instruments. One was an online survey that was administered to the entire membership of the Library Association of Trinidad and Tobago (LATT). The other was a semi-structured interview that was administered to two participants.

The results show that OSS is known and is perceived as “a great tool” but its adoption is low. In addition, although users have been able to enjoy some of its benefits such as free/low license cost, they have also been faced with issues chief of which is a lack of staff expertise. This has limited the exploitation of the software’s full capabilities. But the challenges can be resolved and non-users can also be encouraged to embrace the technology to enhance their libraries’ operations. Recommendations include the adoption of an organized approach inclusive of workshops, establishment of partnerships and user groups, training as well as the development of policies and the commitment of funding.

Suggestions for further research include a case study to determine migration costs. Another is a longitudinal study to determine if adoption levels have changed following promotional activities.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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Date

STATEMENT 1

This work is the result of my own investigations, except where otherwise stated. Where correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

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ABBREVIATIONS

DL	Digital Library
E-LIS	EPrints in Library and Information Science
FLOSS	Free/Libre Open Source Solutions
FOSS	Free and Open Source Solutions
FOSS4LIB	Free Open Source Software for Libraries
FSF	Free Software Foundation
GNU	Gnu's Not UNIX
GPL	General Public License
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
ILMS	Integrated Library Management System
ILS	Integrated Library System
IR	Institutional Repository
IT	Information Technology
JSTOR	Journal Storage
LATT	Library Association of Trinidad and Tobago
LIS	Library and Information Science
LISA	Library and information Science Abstracts
LISTA	Library and Information Science and Technology Abstracts
LOSS	Libraries Open Source Software
OPAC	Online Public Access Catalogue
OSI	Open Source Initiative
OSS	Open Source Software
OSS4LIB	Open Source Systems for Libraries
TCO	Total Cost of Ownership
T&T	Trinidad and Tobago
UWI	University of the West Indies

CHAPTER 1: INTRODUCTION

This chapter presents the purpose of the research and its aim and also identifies the questions to be answered upon completion of the research. The chapter also identifies the scope and limitations of the research and its importance.

1.1 BACKGROUND

The Republic of Trinidad and Tobago is a twin island state situated off the northern edge of the South American mainland (Appendix A). Its economy is primarily industrial, with an emphasis on petroleum and petrochemicals and this has been the basis for economic prosperity for several decades. Thus, when there was a sharp reduction in global energy prices in the early part of 2015, it affected the economy adversely, decreasing revenues and causing an overall reduction in economic growth. The net effect has been a rise in unemployment due to downsizing and the closure of businesses, drastic budgetary cuts and a clarion call to all to reduce expenditure (Trinidad and Tobago. Central Bank, 2016; Trinidad and Tobago. Ministry of Finance, 2016). It is within such tough economic climates that libraries in Trinidad and Tobago and in the world at large must operate. Now more than ever, there is a constant need to justify library budgets, establish priorities and be resourceful to achieve more with less. Breeding (2009, p. 24) echoes similar sentiments: “as financial pressures mount, libraries will explore every possible option for reducing their costs while maintaining adequate levels of service”.

But financial constraints are not the only challenge. Creative strategies such as the use of digital technology must be employed by libraries to stay relevant and evolve into value-added information providers in this knowledge society and be not merely custodians. According to Krist (2009, p. 5) “the next generation of library users will be looking for cutting-edge technologies, including open source technology” and libraries that fail to follow these trends, will become “increasingly marginal” (Jaffe and Careaga, 2007, p. 1).

It is in this context of an ever-increasing need for technology and ever-decreasing

financial resources that open source software (OSS) offers libraries an attractive solution (Payne and Singh, 2010, p. 708).

1.2 PURPOSE OF THE RESEARCH

This research seeks to determine the current application of open source software (OSS) solutions in libraries in Trinidad and Tobago (T&T), whether it is being used for housekeeping operations, collection management, digital preservation, reference services or for some other purpose. It also strives to know the possible benefits and barriers to OSS adoption as well as interest levels in and attitudes towards the adoption of OSS among library and information professionals in T&T.

1.3 AIM AND RESEARCH QUESTIONS

The establishment of a digital library using OSS, at this researcher's workplace (a law library) prompted an interest in this study. There was a strong desire to enhance the provision of information to users using digital technology, and several proprietary solutions were reviewed. However, financial constraints prevented this from becoming a reality. Open source software became a viable option after it was recommended by a colleague who had a favourable experience using such software. This led to the main research question: *Are libraries in T&T using open source software to provide or enhance the provision of services and information to users?* Thus, the principle aim of the study is to investigate the state of adoption of open source software in libraries in Trinidad and Tobago. The specific research questions to be answered are:

- What is the extent of use of open source software in libraries in Trinidad and Tobago?
- What are the benefits or advantages of using open source software generally and in the context of Trinidad and Tobago?
- What are the key issues related to the adoption of open source software generally and as it relates to the Trinidad and Tobago environment?

- What are the levels of awareness, interest and attitudes towards the value of adopting open source software among library and information professionals in Trinidad and Tobago?

1.4 SCOPE AND LIMITATIONS

The research focuses on libraries and information professionals that are members of the Library Association of Trinidad and Tobago (LATT) specifically personal members as this category of membership (Appendix B) would be most relevant to the present study. The decision to limit the population to LATT members was due to time constraints and was also a practical one as this would allow easier access to participants as contact information can be obtained through the association's membership list. In addition, apart from the impracticality of surveying all the libraries, it is believed that the LATT would have a fair representation of libraries in T&T – public, special, academic and school.

The research does not focus on individual open source software applications and so these are only highlighted in the study. In addition, although some comparisons are made with proprietary software, this research does not set out to do any major comparisons between open source and proprietary software. However, comparisons are done with results from previous research.

1.5 IMPORTANCE OF THE RESEARCH

Although research has been done on the adoption of OSS by libraries in various parts of the world - South Asia (Hanumappa, Dora and Navik, 2014; Rafiq and Ameen, 2009), in Africa (Maua and Mwititi, 2013), in the Middle East (Asemi, Hosseini and Asemi, 2010) and in Australia (Keast, 2011) - the literature has not shown any conducted within the Caribbean context. Thus, this research would add a Caribbean perspective to the current state of knowledge in this area. The research can also provide a basic understanding of open source software (OSS) so that libraries in T&T that have not adopted such software can begin to see the possibilities that are available to them. In addition, it would provide libraries in T&T with practical

information on the benefits as well as the key issues related to the adoption of OSS, drawn from experiences in their present local context. Moreover, library and information professionals may also be encouraged to work collaboratively to find workable solutions to resolve similar challenges or to venture into new areas of development.

The research is also timely as T&T is currently experiencing many economic challenges and this is most certain to affect libraries of all types within the country. Thus, the findings of this research can provide important information that can help libraries to make informed decisions about the adoption of OSS if or when the time arises.

1.6 STRUCTURE

The dissertation is divided into six chapters. Chapter one provides a background to the research, its purpose, aim and research questions to be answered. It also presents the scope and limitations as well as the importance of the research. Chapter two critically reviews the knowledge and experiences of library and information professionals on the topic as presented in the literature. Chapter three presents the methodology used to conduct the research while Chapter four presents the results. The fifth Chapter discusses the findings and Chapter six presents the conclusion of the study and recommendations.

1.7 REFERENCING

The Harvard citation style is used throughout this dissertation.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents an analysis of the literature on the topic. It begins with the methodology used to review the literature and an overview of some of the main findings. This is followed by a definition of OSS and an explanation of related terms. It then presents a discussion of the main themes that are relevant to the study inclusive of the history of OSS.

2.2 SEARCH STRATEGY

The methodology used to locate relevant material on the subject began with the development of a list of key words and phrases (Appendix C). Then these were entered in search tools such as Library and Information Science Abstracts (LISA), Google Scholar and Journal Storage (JSTOR). As far as possible, information was sought from a variety of sources such as journal articles, conference papers, books and dissertations. To reduce the volume of results, filters such as language and date ranges were applied when these were available. To determine relevance, abstracts were reviewed when available and then appropriate materials were placed under broad categories such as historical, specific application and issues. Articles duplicated in the results from the different searches were considered important and these were given priority and their bibliographies used to find additionally resources. In addition, emphasis was placed on studies and information from developing countries such as India and South Africa as it was believed that these would be most relevant to the present study.

2.3 RESULTS OF LITERATURE REVIEW

The literature revealed that OSS has evoked great interest since its genesis and has been discussed in various conferences, research papers and articles by researchers and practitioners from both the developed and developing world. There were articles that provided a foundational or general overview (e.g. Barve and Dahibhate, 2012;

Payne and Singh, 2010; Poulter, 2010) or focused on specific issues related to OSS adoption (e.g. Thacker and Knutson, 2015; Rafiq and Ameen, 2009). Many were cases studies that discussed a specific type of software (e.g. Ahammad, 2014; Dennison and Lewis, 2011; Keast, 2011). These studies were particularly helpful as they provided insights on the reasons the particular software was chosen and some of the benefits and challenges that were experienced. Some featured library-based groups or websites dedicated to the promotion of OSS. One such article discussed the establishment of FOSS4LIB (Free Open Source Software for Libraries), a website that offers a range of decision support tools for libraries interested in implementing open source (Blowers, 2012).

The literature revealed varying levels of adoption of OSS especially in developing countries. Some were determined by type of institution, others by geographic location. For example, studies conducted in South Africa revealed that even though open source was adopted nationally, many academic libraries had a conservative approach to these solutions (Makhathe and Mabanza, 2013; Hoy and Koopman, 2008). There were a few studies on the awareness and levels of interest in adoption of OSS. Particularly useful was Satpathy and Maharana (2012).

2.4 DEFINITION/EXPLANATION OF TERMS

Before the findings of the literature review are presented, it is necessary to define and explain certain terms to provide a better understanding of the information presented.

2.4.1 Open Source Software (OSS)

Open source software (OSS) can be described as both a philosophy and a type of computer software development and distribution model (Ching, 2015). The philosophy behind this model is the open sharing of, and access to information as characterized by the “hacker ethic” (Ching, 2015). The definition of the term “hacker” is not the one used by the popular press of a destructive system cracker but rather one who is both a skilled professional programmer and a passionate hobbyist

wishing to advance computer science (Bretthauer, 2001). In terms of its development and distribution, OSS is unlike other types of source code files, not publicly published, which are known as “proprietary” (i.e. “closed source”) and are kept private (Poulter, 2010). Eric Raymond uses the metaphors of the ‘Cathedral’ and the ‘Bazaar’ to illustrate the difference between the two. The former symbolizes commercial software development which takes place in a closed environment with dedicated software engineers. The latter describes the open source paradigm where software development happens in a community setting in public view (Raymond, 2000). Thus, according to Rafiq and Ameen (2009, p. 601), “open source software (OSS) is computer software whose source code is available under a license that permits users to use, change, and improve the software, and to redistribute it in modified or unmodified form.” The ultimate result is that this open sharing of knowledge, expertise, and skills facilitates peer review of the source code and the fixing of bugs with impressive speed. These principles of OSS which are quite dissimilar to those of proprietary software are summarized below (Table 1).

Table 1: Major Open Source Principles (Adapted from Breeding, 2008, p. 8)

ISSUE	OPEN SOURCE	PROPRIETARY SOFTWARE
Source Code	Available to anyone that uses the software	Not distributed to customers
Who can make changes?	Anyone that uses the software	Only the original developer or designates
Sharing-redistribution	Users may share the software	Users may not share, resell, or further distribute software
License scope	Generalized: must not be specific to a given product	Licenses apply to a specific product

OSS is sometimes confused with other software. It is neither freeware nor public-domain software. The former is copyrighted and given away by its owner for others to use. Modifications and commercial redistribution are prohibited. Public-domain software is software whose copyright has expired or has been released from copyright obligations, rendering it free of restrictions on usage and redistribution. Also, OSS is not shareware. This is a software that is released free of cost and usually allowed on a trial basis regarding time usage or functionality to encourage purchase (Barve, 2008, p. 6).

2.4.2 Other Terms

OSS is often characterized as *free software* as they share a similar root. The word “free” does not mean free of cost but should be equated with freedom (Morgan, 2003 cited in Chouhan, 2010, p. 23). In other words, it should be seen as ‘free speech’ not ‘free beer’ (Stallman, 2012).

As free software and open source share common goals, they are also referenced in the literature as *Free/Libre Open Source Software (FLOSS)*. “Libre” has the same meaning as the English word “free” but stresses the freedom to modify and distribute such software in non-English speaking countries as opposed to being free of charge. A variation of this term is *Free and Open Source Software (FOSS)*. The terms are used to show neutrality between free software and open source (Stallman, 2012). Yet another variation is *LOSS* which means *Libraries Open Source Software*.

For the purposes of this study the term “OSS” is the prime focus however, some of the terms highlighted above will be used occasionally as presented in the literature. Following is a discussion of the main themes that have been identified from the literature review which are relevant to this research.

2.5 HISTORY OF OSS

Open source software (OSS) is not a new phenomenon. It has been around for over two decades. In fact, it has a long history of supporting technology infrastructure such as sending information across the Internet, delivering web pages, and relaying electronic mail (Altman, 2001). It can also be said to be rooted in the Free Software Movement. However, although OSS and free software share a commonality, there are some who are of the view that they are not the same and some differences in meanings and values have been identified. These are expanded upon below.

2.5.1 Free Software Movement

The free software movement was launched in 1983 by Richard Stallman with the development of the GNU (Gnu’s Not UNIX) Project and in 1985 the free software

foundation (FSF) was established to support the movement. Proponents of this movement emphasize the ethical and philosophical aspects of community use and development of free software. According to Stallman (2012), “when we call software ‘free,’ we mean that it respects the users' essential freedoms: the freedom to run it, to study and change it, and to redistribute copies with or without changes”. He openly objects to the term “OSS” and indicates that it allows the inclusion of proprietary software and ignores the philosophical issue of software freedom. Without these freedoms, there is no philosophical imperative to improve one’s community (Bretthauer, 2001). Stallman (2012) concurs and points out that the freedoms are not just for the individual users' sake, but for society as a whole because they promote social solidarity—that is, sharing and cooperation. He goes on to add:

“The two terms describe almost the same category of software, but they stand for views based on fundamentally different values. Open source is a development methodology; free software is a social movement. For the free software movement, free software is an ethical imperative, essential respect for the users' freedom. By contrast, the philosophy of open source considers issues in terms of how to make software ‘better’—in a practical sense only.”

(Stallman, 2012)

2.5.2 Open Source Movement

Not all the users and developers of free software agreed with the goals of the free software movement. In 1998, a part of this community splintered off and began campaigning in the name of “open source” - a term that was originally proposed to avoid a possible misunderstanding of the term “free” software, which implied zero cost and not the intended meaning of freedom (Randhawa, 2008). However, the term soon became associated with philosophical views quite different from those of the free software movement. In that same year, the movement headed by Eric Raymond formalized themselves into an organization called the Open Source Initiative (OSI). Unlike proponents of the free software movement, “open source” adherents emphasize the pragmatic and business-friendly aspects of the technology (De, 2009). They seem to believe that FSF and Richard Stallman, despite their great initial contributions, failed to take the movement to the commercial world (Rajani, 2003).

2.6 LICENSING

The fundamental purpose of open source licensing is to deny anybody the right to exclusively exploit a work (St. Laurent, 2004, p. 4). Thus, the licensing process protects the rights of the creators and collaborators while allowing users broad access (Jaffe and Careaga, 2007, p. 2). Licensing of open source products is rather straightforward. Although there are over sixty-five different open source licenses, there is one that predominates - the General Public License (GPL). It serves as the license for approximately 70% of open source products.

The GPL first appeared in 1989 and was authored by Stallman. Commentators often refer to GPL as “copyleft” licensing. It is a reversal of the name copyright (Corbly, 2014, pp. 67-68). To copyleft a program, first it is copyrighted; then distribution terms are added, which are a legal instrument that gives everyone the rights to use, modify, and redistribute the program’s code or any program derived from it but only if the distribution terms are unchanged. Thus, the code and the freedoms become legally inseparable. Proprietary software developers use copyright to take away the users’ freedom; copyleft use copyright to guarantee their freedom hence the reversal of the name from “copyright” to “copyleft” (Stallman, 2001 cited in Bretthauer, 2001). Over the years, the GPL (which incorporates Stallman’s four freedoms) has been revised and now lists ten criteria for a software product to be called open source. These are sometimes referred to as the ten commandments (Appendix D).

2.7 APPLICATIONS AND USAGE

OSS has proven to be useful beyond the library sector. In fact, it has been shown to have many attractions for developing economies (Rafiq and Ameen, 2009). It has been adopted by governments to roll-out ICT projects (Hedgebeth, 2007) and to provide effective delivery of services because of lower costs when compared with commercial software (Mutula and Kalaote, 2010). Also, OSS is now in widespread use in commercial enterprises (LeClaire, 2016) and is becoming more prominent within the education market (Davidson, 2008).

OSS also offers attractions for libraries. There is no longer any skepticism about its

viability and ability and today it permeates all aspects of library technology, ranging from behind-the-scenes infrastructure to full-fledged applications (Breeding, 2016). In fact, its quality and usefulness has been demonstrated even to the point where it could pose major challenges to the dominant position of proprietary software (Nagy, Yassin and Bhattacharjee, 2010). Products include but are not limited to web servers, server operating systems, desktop operating systems, web browsers, databases, email and other information and communication technology (ICT) infrastructure systems (Ghosh, 2007 cited in Cherukodan and Kabir, 2016).

OSS is used in libraries to assist with reference services, eBook management, course reserves and as a cataloguing tool. It is also used for online public access catalogues (OPACs) and integrated library systems (ILSs)/integrated library management systems (ILMSs) as well as for building institutional repositories (IRs)/digital libraries (DLs). Examples of some these solutions are presented in Appendix E. OSS usage has been encouraged by many advocates as they provide many benefits. Some of these are examined in the next section.

2.8 BENEFITS

Many authors have advocated the suitability of open source to libraries. Some see OSS as a “natural fit” (Cervone, 2003; Poynder, 2001, p. 67). Jaffe and Careaga (2007, p. 5) echoes similar sentiments, describing it as a “natural ally” of the library community as its underlying philosophy is similar to the professed core values of librarianship. Eric Morgan (2002) outlines the similarities:

“Both camps put a premium on open access and both advocate open standards. Both are gift cultures and gain reputation by the amount of ‘stuff’ they give away and both hope the shared information will be used to improve our place in the world.”

(cited in Amin, 2003, p. 16)

But apart from these ideological similarities are there any practical technological advantages that OSS presents to libraries one may ask? Two benefits identified by Cervone (2003) are cross-platform simplicity and an easing of licensing restrictions. These increase the computing flexibility of an organization. The former means that:

“the software does not depend on a specific hardware or operating system

platform in order to function. Thus with OSS, it should be possible to run for example, your library management system modules (such as cataloging, acquisitions, and circulation) on any operating system. Eased licensing restrictions are a major boon to organizations, particularly those with people working from home or in transit. Using OSS, people can have copies of programs on their machines at home, at work, and on the road and the organization is not penalized for doing so by licensing restrictions.”

(Cervone, 2003)

Another benefit reported by Biswas and Paul (2010, p. 9) and Cervone (2003) is the bridging of the digital divide as libraries in developing nations can use OSS to support electronic access and resource sharing and decrease barriers in the dissemination of information and this according to Singh (2014), has implications for social justice. Jaffe and Careaga (2007) further add that that librarians who embrace open source and work for its adoption in libraries and its integration into communities will gain the tools needed to adapt and evolve to become leaders of the information age (p. 1). Other benefits that can be realized but may not be applicable in every circumstance are:

- **More reliable software** – OSS is continually evolving in real time as developers add to it and modify it, which means it can be of a better quality, more secure and less prone to bugs than proprietary systems.
- **Development options/Customization** – Librarians can modify and adapt OSS for their own requirements. Thus, they can get software they want - standards compliant, interoperable, extensible and scalable, that does what they want it to do: help customers find information quickly, conveniently no matter where that information resides (Hasan, 2009). Lack of flexibility to achieve customizations was one of the main reasons expressed by Australian special libraries for switching to an open source system (Keast, 2011). Grant (2008) indicates that libraries have become frustrated as development options have been slow, costly and many times what gets delivered is not what is actually needed. OSS removes many of these problems.
- **Allows users to view and modify the source code** – The ability of users to scrutinize and change the source code not only leads to more reliable software and customization options but also has the potential to create new

products.

- **Encourages a collaborative approach** – OSS encourages an open exchange of ideas, where any user of the software can contribute ideas to improve it. This tends to promote a collaborative approach that may foster innovation.
- **May reduce vendor lock-in** – If a service provider/vendor were to be bought, sold, or consolidated or they wish to terminate service or support, the library can move to a new vendor that will continue to enhance, support and maintain the product. Thus, it remains in control of the decision of when to upgrade or migrate (Grant, 2008).
- **Lowers cost/More efficient use of financial resources** - While there are great debates on the topic, evidence has shown that mature open source applications offer a lower total cost of ownership (TCO) than their commercial counterparts. TCO includes sales price, initial implementation costs, hardware/software upgrades, hosting fees, ongoing maintenance, support and training costs (Poulter, 2010). Some of the key reasons given include: No license fees, low upgrade and maintenance costs due to improved stability and security, smaller hardware costs as OSS can often be used on older hardware. This means that funds can be deployed in other areas (Corbly, 2014). An overall reduction in cost was a deciding factor for Australian special libraries considering a switch to OSS (Keast, 2011). Grant (2008) acknowledges that moving to open source clearly doesn't mean everything is free. But the financial model changes, in favour of the library (p. 230).

Although OSS offers some key advantages, there are some disadvantages that have also been identified in the literature. These would be discussed in the next section.

2.9 ISSUES

Some of the major issues that have caused a low adoption of OSS in libraries can be grouped under the following headings:

1. **Technological/Technical** -

- (a) Level of support available/Technical expertise – A frequent critique of OSS observed in the literature is the lack of technical support during its implementation and the lack of ongoing maintenance of the software (Petrich, 2009; Ho, 2007; Chawner, 2004). This may not be a concern for larger libraries with skilled systems staff who may have the requisite technical expertise; however, many smaller and less financially robust libraries face daunting technical challenges (Pyati, 2009). Further, lack of staff expertise may result in difficulties to customize and serve as a barrier and cripple the implementation of OSS (Al Zeheimi et al., 2014). This issue is a valid concern particularly in the developing world as a lack of appropriate technical skills to provide support was one of the reasons cited for the low adoption of FOSS in academic libraries in South Africa (Hoy and Koopman, 2008) and the adoption of OSS in academic libraries in Kenya (Maua and Mwiti, 2013).
- (b) Documentation – Issues have been raised about the documentation that accompanies OSS applications. It has been said to be of a poor quality and sometimes non-existent (Murray, 2002). OSS developers are motivated towards the technical aspects of the application than towards the usability (Reijswoud and Topi, 2003). However, Corbly (2014) posits that although some open source products lack documentation, many (if not most) have active user groups or communities which serve as sources of assistance to users.
- (c) Training – This is another technical issue cited as a barrier to OSS adoption. Before initiating an OSS project, it is necessary to map out a proper and intensive training program for library staff and end-users. This would form part of the full TCO analysis that should be done on an application before implementing it.

2. **Financial** – Although OSS offers low start-up costs as well as low cost

alternative options for technical support like mailing lists, etc., there is still a need of finance for hardware and human development. According to Clarke (2000) the future success of OSS requires a shift in budgeting priorities. Specifically, much of the financial resources expended on commercial vendors would have to be reallocated for investment in staff. More technical staff members could be hired, or this investment could take the form of technical competency building for existing staff.

3. **Conceptual/Knowledge** – In their study, Rafiq and Ameen (2009) found that library and information professionals were not clear about OSS concepts, benefits, etc. and this lack of clarity contributed to low adoption levels. In other studies, (e.g. Satpathy and Maharana, 2012) inadequate knowledge was cited as a reason for non-use of OSS.
4. **Social/Cultural** – A lack of a culture of collaboration and sharing can impede the success of OSS adoption (Jaffe and Careaga, 2007). Open source succeeds when users contribute back to the product. This can be through contributing code or writing documentation for example. Understanding how to interact with the community of an open source project is key to successful development, selection, deployment and maintenance of software installation. Ignoring the community may result in users missing patches, releases and upgrades. However, asking and answering questions, making bug reports, and contributing software evaluations and best practices stirs the pot of the community and keeps it active (Petrich, 2009).

2.10 SUMMARY

The literature review revealed that the principle philosophy of OSS is to allow users under a license, free access to and use of the software's source code for adoption, modification and redistribution. It was also noted that OSS is sometimes confused with other software but shares a common goal with free software despite divergent philosophies.

The review also showed that although OSS is likely to be adopted by libraries as they

are culturally similar, it has also been adopted by governmental, commercial, and educational organizations to counter tightened budgets and rising operational expenses. OSS also offers similar benefits to libraries as well as flexibility to do adaptations or customizations and no vendor lock-in. However, equally important are issues that must be considered before any such adoption takes place. Prime concerns are the lack of technical support and staff expertise.

The next chapter discusses the Methodology used to answer the research questions, outlined in Chapter one.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the research approach and design, methods used to collect the data and their reliability and validity. It also describes how the data was analyzed and explains how ethical concerns were addressed. The chapter concludes with an examination of limitations encountered and lessons learned.

3.2 RESEARCH STRATEGY

A research strategy is a general orientation that can be used to conduct research (Bryman, 2012, p. 35). To determine the most suitable approach to adopt, research that had a similar purpose or which set out to answer comparable research questions were examined. Thus, research that sought to assess use and/or awareness of OSS (Majeed, 2016; Reddy, 2014; Bhavsar, 2013; Satpathy and Maharana, 2012) or identify barriers/problems in the use of OSS (Hanumappa, Dora and Navik, 2014; Singh, 2013; Chouhan, 2010) or sought to investigate perceptions and attitudes towards OSS adoption (Gireesh Kumar, 2016; Gireesh Kumar and Jayapradeep, 2015; Muruli and Gireesh Kumar, 2014; Dalling, 2011; Rafiq, 2009) were reviewed. Most of these studies used a quantitative approach; one was qualitative (Al Zeheimi et al., 2014) and two used a mixed methods approach (Dalling, 2011; Chouhan, 2010). As there seemed to be some value in both approaches, they were combined for this research. Thus, a mixed methods approach was adopted, that is a qualitative component was incorporated into a primarily quantitative research.

Although arguments have been presented against such an integration of methods namely that each has a different epistemological commitment or that they are separate paradigms, this has not been proven in social research. There are areas of overlap and commonality between them and they can be combined in many ways so that the strengths of each can be used to offset their weaknesses (Bryman, 2012, p. 630). The quantitative data would be used to answer the research questions

(identified at section 1.3 of Chapter 1) pertaining to the extent of use of OSS, the benefits or advantages of using OSS within the T&T environment and the levels of awareness, interest and attitudes towards the value of adopting OSS among library and information professionals in T&T. This would provide an overall picture of the current state of the adoption of OSS in libraries in T&T. The qualitative approach would be used to explore key issues and to strengthen and fill any gaps related to the benefits of using OSS that may result from the quantitative method. Thus, the mixed methods approach would be used to answer different research questions and the triangulation would ensure completeness of the research and help to fortify and enrich its conclusions (Hesse-Biber, 2010, pp. 3-4).

3.3 RESEARCH DESIGN

This research employed a cross-sectional design as the framework for the collection of data on more than one information professional at a single point in time (Bryman, 2012, p. 58). Other designs were examined but were eliminated. A case study would only provide data on a single library and as such its findings cannot be generalized across the sector. Although a comparative design would increase the number of libraries to be examined it would only give contrasts on two cases. An experimental design would be impractical as it would involve the manipulation of a variable, a difficult task in this present research. Similarly, with a longitudinal design, time constraints would not have allowed participants to be surveyed on at least one further occasion.

3.4 RESEARCH METHOD

A research method is simply a technique for collecting data (Bryman, 2012, p. 46). The studies that were examined to identify a suitable research strategy for this research all used a questionnaire as their data collection tool. This was also the case with the qualitative study which used focus groups to investigate perceptions of the library and information science community towards OSS adoption in libraries in Oman. Questionnaires were used to gather data before and after the workshop to

measure the participants' use of and knowledge about OSS (Al Zeheimi et al., 2014). The use of focus groups in this research was not considered as there would be some difficulty in getting together members of the survey population simultaneously; a task that is even difficult to do for regular and annual general meetings of the Library Association of Trinidad and Tobago (LATT). Further, the two mixed methods studies used both questionnaires and semi-structured interviews as their data collection tools. Additionally, Chouhan (2010) also used field observations. However, it was noted that the interviews were the most useful as they helped to complete information that was left unanswered from the questionnaires. It was therefore decided to utilize these two tools to collect data, specifically self-completion questionnaires and qualitative semi-structured interviews.

3.4.1 Population and Sampling

The population for this research was information professionals that are members of the LATT. Ideally, the sample of participants were to be drawn from the personal membership (Appendix B) as this was the category most relevant for the study. However, the survey was distributed to the entire membership although a request was made for its distribution to only the named category (see subsection 3.4.2.3 - Distribution). It therefore means that the entire population which numbered 175 was surveyed and as a result no sampling was done. Additional figures provided by the Library Association are 125 professional members and five institutional members; three of these are academic, one public and one special. The researcher was unable to obtain a further breakdown of the membership.

3.4.2 Questionnaire

The questionnaire was created using SurveyMonkey (an online software package specifically designed to conduct surveys) and comprised of 18 questions. A variety of question types were included for example closed questions, multiple choice and ranking style questions (Appendix F). Also, a five-point Likert scale was used for some questions to ascertain respondents' interest, perceptions and attitudes on specific areas. Consideration was given to the advantages and disadvantages of each and this

resulted in a mixture that would solicit the most appropriate responses. Specific rules were observed when designing the questionnaire for example avoiding ambiguous terms and long or double-barreled questions (Neuman, 2014, pp. 322-324). The questions were also arranged under specific headings identified from the literature review to assist with general understanding. In addition, questions used by other researchers were examined to assist with the overall development of the questionnaire. Permission was sought and received (Appendix G) to use and/or modify some questions from Dalling (2011).

3.4.2.1 Strengths and Weaknesses

The mode of survey administration via the web, had a number of advantages as opposed to an email survey. It allowed a wider variety of customization in terms of appearance and it reduced the time taken and the likelihood of errors in the processing of data (Bryman, 2012, p. 671).

In addition, as indicated at section 3.2, Bryman (2012) noted that the strengths of each method (qualitative and quantitative) can be used to offset their weaknesses. The advantages of the self-completion questionnaire over the semi-structured interview were that it was quicker to administer and there was a removal of researcher bias and variability. On the other hand, the disadvantages were the inability to probe respondents to elaborate an answer, a greater risk of missing data, low response rate and the wrong persons responding to the questionnaire. However, the strengths of the semi-structured interviews (outlined at subsection 3.4.3.1) assisted in rectifying some of these shortcomings.

3.4.2.2 Piloting

The questionnaire was piloted by sending it to an information professional outside of Trinidad and Tobago who was a colleague of the researcher. Although it is recommended that the survey be piloted using a sample of the proposed population, it was decided to use someone outside the Trinidad and Tobago environment to safeguard corruption of the data through prior knowledge. The individual was asked to provide feedback on clarity, length of time to complete and sequencing of

questions. A positive feedback was received for all the areas that were enquired about.

3.4.2.3 Distribution

A letter was sent via email to the President of the LATT explaining the research's aim, ethical commitments and requesting permission to conduct the survey (Appendix H). A request was also made to have the survey distributed to only personal members once this was possible. Once permission was granted, an invitation with a link to the online survey (Appendix I) was sent to LATT for distribution. The survey was open for approximately two and a half weeks, that is over the period Wednesday, August 30, 2017 to Friday, September 15, 2017. To boost the response rate, a reminder was issued three days before the closing date of the survey, that is on Tuesday, September 12, 2017 and this resulted in the receipt of 18 additional responses.

3.4.3 Interviews

An interview guide was developed as recommended by Bryman (2012, p. 471). It comprised approximately 23 questions (Appendix J). Semi-structured interviews were conducted with two library and information professionals from special libraries. This type of interviewing was chosen as it allowed some flexibility in terms of the sequencing of questions and some latitude to ask further questions if required. Ideally, interviews were to be conducted with about five persons from different libraries, who were using varying OSS solutions so that different views could be obtained. However, this did not happen despite repeated attempts to schedule these interviews. These individuals were selected based on the researcher's knowledge of the presence of OSS at their respective library.

3.4.3.1 Strengths and Weaknesses

The main strength of using semi-structured interviews was that they enabled respondents to speak at length about their experiences. This countered some of the disadvantages of the questionnaire (as stated at subsection 3.4.2.1) namely missing

data and the inability to probe for additional responses. Although the process may have been open to researcher bias and lack of honesty on the part of the participant (Bryman, 2012, pp. 227-229), the careful construction of the interview guide using themes from the literature and findings from the questionnaire as well as refraining from expressing personal views or opinions were an effective check against such bias.

3.4.3.2 Piloting

The semi-structured interview was piloted by conducting a telephone interview with a library and information professional who is a colleague of the researcher. This individual does not reside in Trinidad and Tobago and was not used for the questionnaire. Feedback was sought about how the researcher conducted the interview and clarity of questions. Based on the feedback received, some additional questions were added to solicit further information and some questions were rephrased to improve clarity. The researcher was also advised to maintain a steady tone to ensure that the full question will be heard by the interviewee.

3.4.3.3 Conducting Interviews

Before the interviews were conducted, informed consent was obtained (see section 3.7). Additional calls and/or emails were then made or sent to finalize the actual date and time for the interview. The interviews were conducted in person and began with a statement of its main purpose which was to explore the benefits and key issues that are associated with the adoption of OSS. The researcher also confirmed with participants their consent to have the interview recorded. Recording interviews is advocated by Bryman (2012, p. 482) as it allows accurate transcripts to be prepared and prevent important details from being missed. The interviews were recorded with a cellular phone. Next, some general questions were asked to solicit demographic information and this was followed by the main questions. As the interviews proceeded, some questions were omitted depending on the interviewees' previous responses and additional probing questions were asked where useful. The duration of the interviews were about 30 to 35 minutes and both were conducted in September 2017.

3.5 RELIABILITY AND VALIDITY

In this study, reliability and validity (construct and external) were featured. Reliability is concerned with the consistency of a measure of a concept, that is whether the same results would be obtained if the same measures are repeated on the same population by another researcher. (Bryman, 2012, p. 169; Hesse-Biber, 2010, p. 100). Construct validity is the degree to which a test measures what it claims, or purports, to be measuring and external validity is concerned with whether the results of the study can be generalized to a wider population.

Efforts were made to ensure reliability and subsequently replicability by documenting procedures for the selection of participants for both the collection of quantitative and qualitative data; the administration of the research instruments and the analyzing of the data. Construct validity was observed by using multiple sources of information and data collection instruments. This allowed for data triangulation. In terms of external validity, since the entire population was surveyed, sampling errors were eliminated and this would contribute to the production of statistically valid results.

3.6 ETHICAL CONSIDERATIONS

This research followed the guidelines laid out in the Ethics Policy for Research, Department of Information Studies, Aberystwyth University.

In addition, to obtain informed consent for the survey, a letter stating the purpose of the research, its aim and ethical commitments was provided with the questionnaire. The return of a questionnaire indicated that the participant agreed with the stated information. In terms of the interviews, persons were briefed via telephone communication about the study and the extent of their involvement, then asked to participate. Permission was also sought for audio recording. Once verbal consent was given, this was followed by a formal letter sent via email, explaining the research's aim and ethical commitments (Appendix K).

To ensure anonymity and confidentiality participants were assured that no names

would be used and published. They were also told that the research data would be stored in a password protected file on a removable storage medium and it would be kept for only as long as is necessary to: a) analyse the research data b) report on the research and its findings and c) facilitate any review (usually about six months after completion of project). Once these had been accomplished it would be deleted.

3.7 DATA ANALYSIS

In mixed methods research, the researcher can choose to integrate or not to integrate the analysis and findings. According to Hesse-Biber (2010) this decision should be based on the research problem (p. 84). It was decided to report separately in Chapter 4: Results, each set of data collected but to analyze and integrate the findings in Chapter 5: Discussion. SurveyMonkey provided the analysis of the quantitative data. Interviews were transcribed with the assistance of a free open source transcription tool - oTranscribe and then transferred to Microsoft Word. Key themes from the literature review were then identified and these were coded. A sample of an interview transcript with coding is provided in Appendix L.

3.8 LIMITATIONS AND LESSONS LEARNED

A few limitations were encountered. One was that despite repeated attempts to have additional participants for the interviews, as was indicated at subsection 3.4.3, this did not materialize. Although these persons expressed their willingness to participate initially, they were not readily available when subsequent attempts were made via telephone calls and email to contact them. Thus, on several occasions, dates and times for interviews had to be adjusted when contact was made. It is not known for certain whether their unavailability was due to heavy work schedules or a change of mind. Perhaps, these may have been possible, if they were no time constraints. It is believed that this additional data would have enhanced the validity of the results as the prospective participants were from different libraries namely academic, public and special and were using OSS for different purposes so it would have been interesting to see if similar benefits or issues were part of their experiences.

Another was the length of time that the survey was open. Again, due to time constraints, the survey was only opened for about 17 days. Efforts were made to have it begin in late July or early August but although permission was sought for its distribution from the LATT in late July 2017 a response was only received a month later (late August 2017). This was due to many of the members of the executive being on vacation leave. It is believed that a longer period may have resulted in a higher response rate and again a strengthening of the validity of the findings.

The lesson that was learned from these experiences is that sometimes despite one's best efforts things do not go according to plan and therefore adjustments may have to be made to bring one's plans to a satisfactory conclusion or to accomplish a goal.

3.9 SUMMARY

A mixed methods approach was adopted for the research and it employed a cross-sectional design as the framework for the collection of data. Two research instruments were used to collect the data. One was a self-completion questionnaire that was administered to the entire membership of the LATT which numbered 175. The other was a semi-structured interview that was administered to two participants. The questionnaire was created and administered using SurveyMonkey and the subsequent quantitative data was also analyzed using this application. Transcription was aided using oTranscribe, a free open source transcription tool along with Microsoft Word. A few limitations were identified and these included a small number of interviewees and the short duration of the survey.

The results would be presented in the next chapter.

CHAPTER 4: RESULTS

4.1 INTRODUCTION

This chapter presents under separate headings, the results from the online survey (summarized in Appendix M) and the interviews that were conducted. It begins with the quantitative data which provides the response rate and demographics of the respondents, followed by other findings presented under various headings that were also used for the literature review such as Knowledge of OSS, Benefits and Issues. A similar method is adopted for the qualitative data that follows. The chapter concludes with a summary of the main findings. The figures (not percentages) stated in the quantitative results are the actual number of answers.

4.2 ONLINE QUESTIONNAIRE

4.2.1 Response Rate and Other Descriptive Data

A total of 43 responses were received. This represents a response rate of approximately 25% as the total membership of LATT is 175. According to Bryman (2012, p. 235) some may view this as unacceptable as there is the risk of bias but he notes that low response rates are not uncommon with online surveys.

Also, the software indicated that there were three incomplete responses but these were included in the analysis as their exclusion would have resulted in a further reduction of the items available for analysis. For these responses, the number of questions that were completed ranged from five to eight resulting in an overall average completion rate of 93%. In addition, there were some missing data due to item nonresponses; some were missing by design or logic as certain questions were not applicable to all respondents (as seen in Appendix F) and others may have been omitted deliberately or by error. In both instances, the software made the necessary adjustments and these are reported in the results.

The largest category of participants numbered 18 (42%) and were from academic libraries, 11 (26%) were from special libraries, seven (16%) were from school libraries

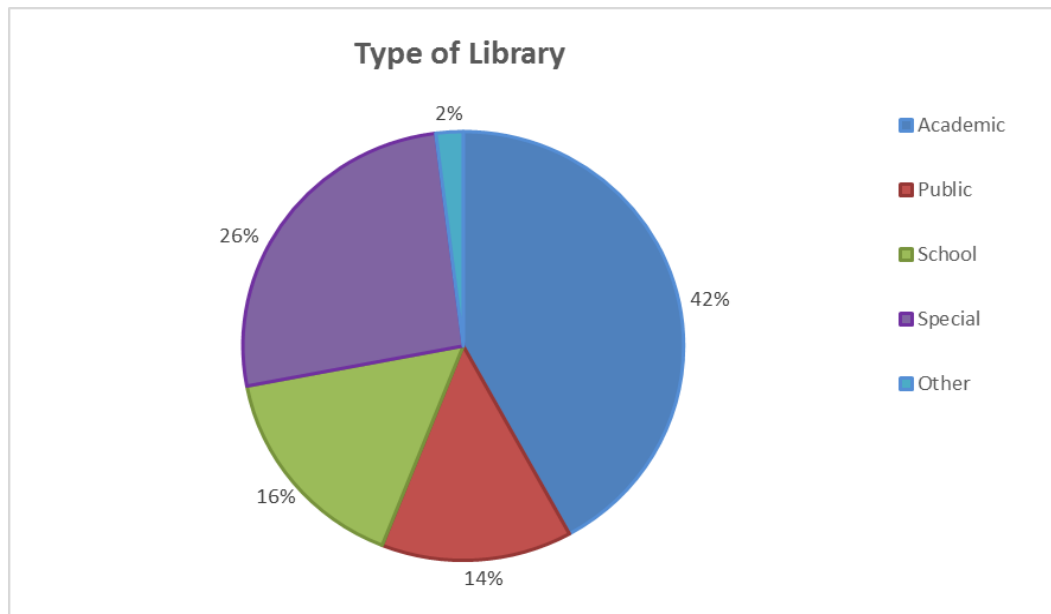


Figure 1: Type of Library

and six (14%) were from public libraries (Figure 1). Only one (2%) participant specified the library type as 'Other'. Participants were asked to specify how many members of staff worked at their library to indicate the size of their institution. The results indicated that participants were from libraries of varying sizes. Out of the 43 survey respondents, 33% were from libraries that were staffed with five or less persons and 49% had 16 or more members of staff at their respective library (Figure 2).

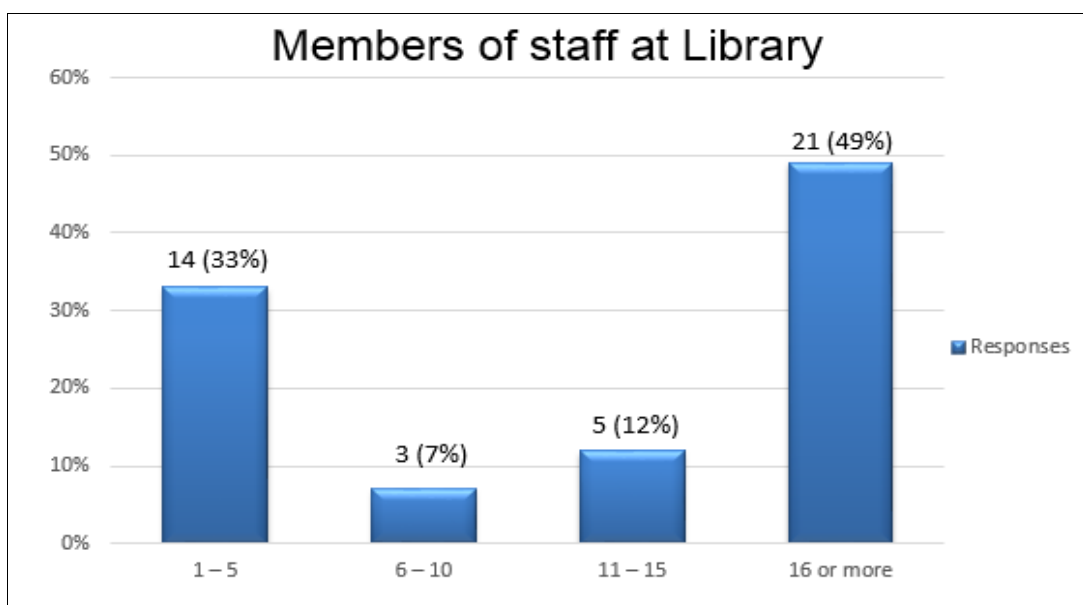


Figure 2: Members of Staff at Library

Participants were asked to indicate their designation or position. A total of 35 (81%) of the respondents stated their designation as Librarian or used a more specific title to show their area of responsibility or specialty such as Campus Librarian, Technical Services Librarian or



Figure 3: Word Cloud of Designations/ Positions of Respondents

Systems Librarian. In some cases, an equivalent name was stated such as Director or Documentation Officer. There was one designation stated as IT Officer. Respondents also included Library Assistants (6) and Library Technician (1). The word cloud (Figure 3) shows the designations/positions that were stated and gives an indication of the numbers for each of them.

Participants were asked to indicate their highest level of qualification to help assess their professional skills and competencies. The highest level of qualification was a Master’s Degree and over 65% of the respondents possessed this qualification (Table 2). It was noted that two of the five respondents that specified ‘Other’ qualification also possessed this degree. The other qualifications included in the ‘Other’ category were Postgraduate Diploma and Associate Degree.

Table 2: Professional Qualification of Survey Respondents

PROFESSIONAL QUALIFICATION	NO. OF RESPONSES	PERCENTAGES					
Doctorate	0	0%					
Master’s Degree	28	65%					
Bachelor’s Degree	10	23%					
Other: Postgraduate Diploma Associate Degree Master’s Degree	<table style="display: inline-table; vertical-align: middle;"> <tr> <td style="padding-right: 5px;">2</td> <td rowspan="3" style="font-size: 2em; vertical-align: middle;">}</td> <td rowspan="3" style="padding-left: 5px;">5</td> </tr> <tr> <td>1</td> </tr> <tr> <td>2</td> </tr> </table>	2	}	5	1	2	12%
2	}	5					
1							
2							
TOTAL	43						

Participants were asked to indicate the number of years of experience they had as a library and information professional. Of the 43 respondents, 15 indicated that they had more than 15 years of experience. Those whose experience in the profession was five or less numbered eight (Figure 4).

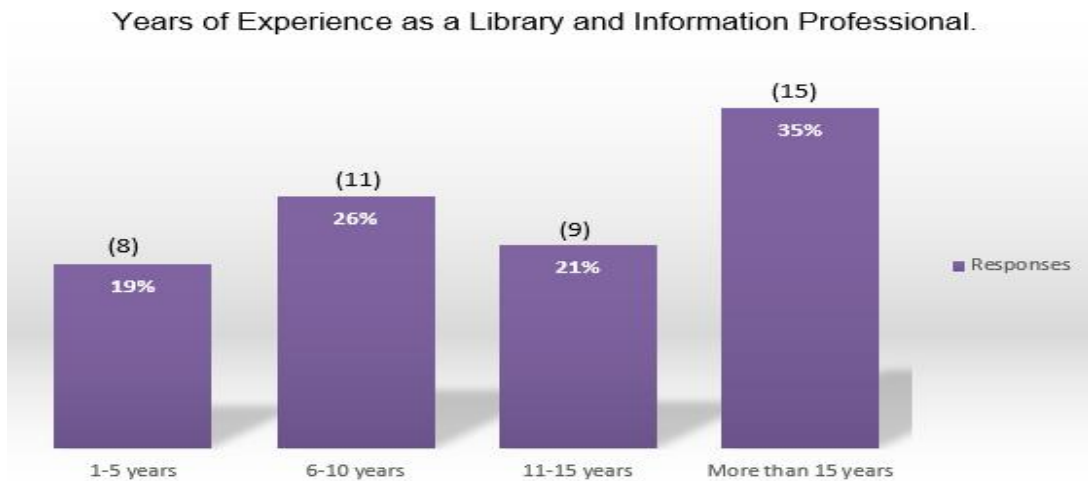


Figure 4: Years of Experience as a Library and Information Professional

4.2.2 Knowledge of OSS

Survey respondents were asked to indicate the extent of their knowledge of OSS. This comprised of four categories:

- Not known
- Partially known – having basic information about OSS
- Known – aware of OSS and its benefits but have not used any applications
- Fully known – very familiar with OSS and its benefits and effectively uses specific OSS applications or solutions

An equal number of respondents (12%) indicated that they did not know about OSS or that it was fully known to them (Figure 5). Those who indicated that they were

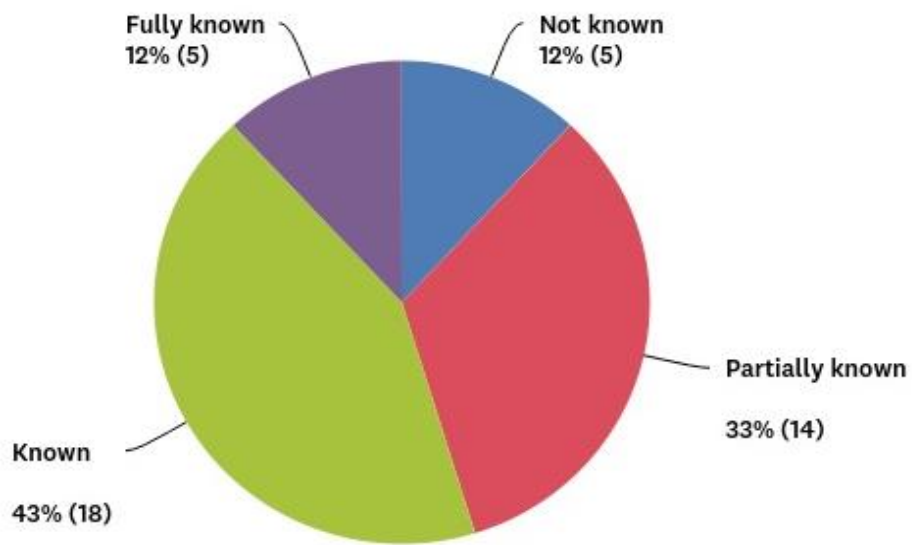


Figure 5: Extent of Knowledge of Open Source Software (OSS)

aware of OSS and its benefits but have not used any applications were in the majority and numbered 18 and about 33% indicated that OSS was partially known to them. Only one respondent did not answer this question.

Respondents who did not know about OSS were asked to indicate if this was an area they would like to explore in the future and all five responded in the affirmative. Survey respondents who knew about OSS were asked to select from five choices, the primary method used to acquire knowledge on OSS. There was also the option to specify any other method. The primary method was by formal education/training such as attending a course or workshop as indicated by 16 of the 37 respondents (43%). Next was through self-study (27%). Other methods included vendor demonstration (14%), from colleagues/friends (14%) and trial and error (3%). No other method was specified (Table 3).

Table 3: Mode of Acquiring Knowledge on Open Source Software (OSS)

METHODS OF LEARNING ABOUT OSS	NO. OF RESPONSES	PERCENTAGES
Formal education/Training (e.g. course/workshop)	16	43%
From colleagues/friends	5	14%
Trial and error	1	3%
Self-study	10	27%
Vendor demonstration	5	14%
Other	0	0%
TOTAL	37	

4.2.3 Usage of OSS

Of the 37 respondents who indicated that they knew about OSS, only 11 (30%) mostly from academic libraries were currently using an OSS solution (Table 4). Some libraries were even using more than one application. The main OSS being used was DSpace. Other solutions included Dataverse, Archivemata, Archivist Toolkit and KOHA. Five respondents did not specify what was being used. The solutions were being used for a variety of purposes. These included institutional repositories/digital libraries, cataloguing tool, newspaper indexing and preservation of archival content.

Table 4: Usage of Open Source Software (OSS) at Libraries

RESPONDENT	TYPE OF LIBRARY	OSS SOLUTION / APPLICATION AND DEFINITION	PURPOSE (As stated by respondents)
#7 #15 #28 #29	Academic Academic Academic Academic	DSpace An open source repository software package typically used for creating open access repositories for scholarly and/or published digital content (DSpace, 2017).	Institutional repository To make digital collections accessible
#28	Academic	Dataverse An open source web application to share, preserve, cite, explore, and analyze research data (Dataverse, 2017).	
#28	Academic	Archivemata A web and standards-based, open-source application which allows your institution to preserve long-term access to trustworthy, authentic and reliable digital content (Archivemata, 2017).	
#7	Academic	Archivist Toolkit The first open source archival data management system to provide broad, integrated support for the management of archives (Archivists' Toolkit (2006-2009).	For describing special collections
#4	Special	KOHA An open source Integrated Library System (ILS) (Koha (software), 2017). (Not stated)	Cataloguing electronic resources
#4 #9 #14 #25 #26 #32	Special Academic Public Public Academic Academic		News article system for newspaper index Cataloguing and Metadata services for creation of records Digital repository of official and heritage materials (Not stated) Metadata for information access in institutional repository (Not stated)

4.2.4 Reasons for Not Currently Using OSS

A total of 26 respondents indicated that they were not currently using any OSS solutions. Participants were asked to select from seven possible reasons that were most cited in the literature. Some of these were: too risky, inadequate knowledge, documentation etc., lack of management support and lack of expertise. Respondents were also provided with an opportunity to give additional reasons. The results presented in Figure 6 indicate that most of the respondents (42%) were currently using proprietary software while 31% (8) indicated that OSS was not required at this time. Only two persons cited lack of expertise as a reason for not using any OSS.

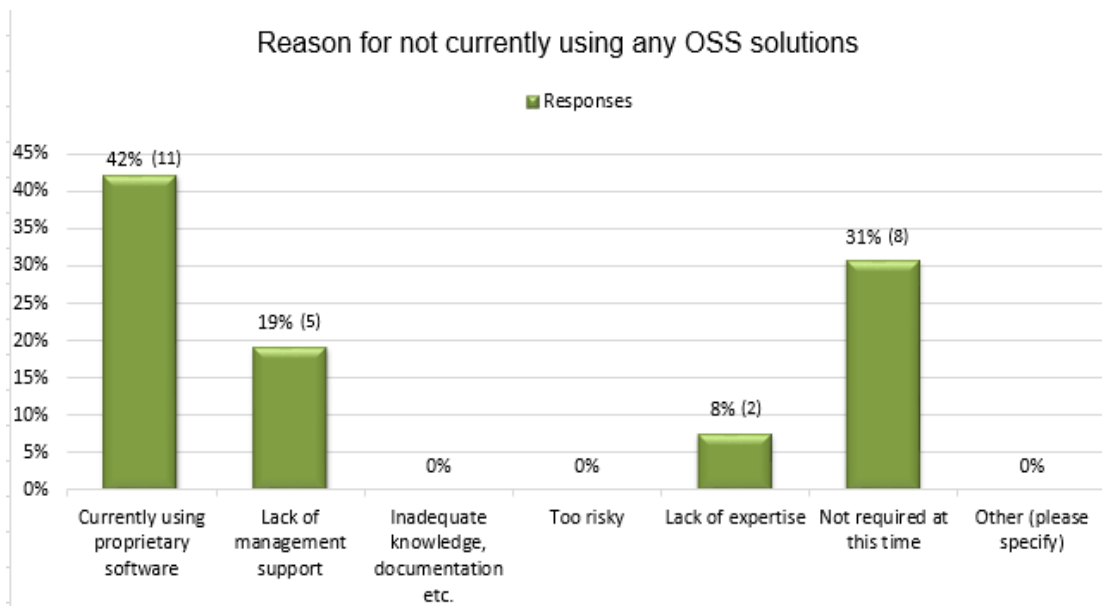


Figure 6: Reason for not Currently Using any Open Source Software (OSS) Solutions

4.2.5 Administration of OSS

4.2.5.1 Factors Influencing Adoption

Respondents using OSS were asked if there were any factors (such as cost and support) that influenced their decision to adopt their current solution. Of the 10 respondents, eight indicated that there were factors that influenced their decision, two indicated that there were none. Six respondents identified the factors, one was not sure and one did not provide an answer. The dominant factor was cost (Table 5). Also mentioned were availability of local expertise/in-house IT support, versatility

and ability to customize to meet local needs.

Table 5: Responses to Factors that Influenced the Decision to Adopt OSS

RESPONDENT	RESPONSES
# 4	Availability of in-house IT support
# 7	I needed software that would not require annual subscription, but at the same time was widely used in the profession to allow for support and troubleshooting
# 9	Cost, versatility, customization to local needs
# 14	Local expertise
# 15	Yes – but the adoption pre-dated my time at the institution – so not aware of the factors
# 28	Cost
# 39	It is not possible to finance a system so we decided to explore OSS

4.2.5.2 Training

Respondents were asked if training was conducted to facilitate present and long-term usage of OSS. Eight of the eleven respondents who were using an OSS solution indicated that training was conducted. The other three indicated that no training was done.

4.2.6 Benefits/Advantages

Participants were asked to indicate on a scale of 1-5 (where 1 is of no benefit and 5 is extremely beneficial) how beneficial six statements (cited in the literature as benefits) were to them or would be to them with the adoption of OSS. The benefits were no vendor lock-in, development options available, easing of licensing restrictions, cross platform functionality, free/low license cost and access to the source code to customize the software (Figure 7).

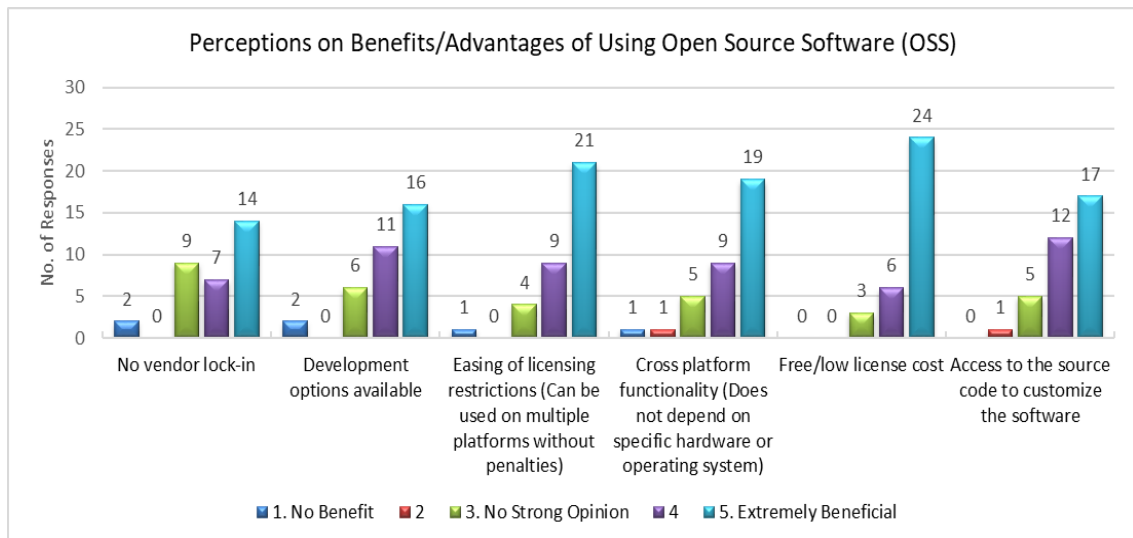


Figure 7: Perceptions on Benefits/Advantages of Using Open Source Software (OSS)

Although 35 of the 43 respondents answered this question not all the statements were rated and this resulted in varying totals for each statement ranging from 32 to 35 (Table 6). Free/low license cost was the most beneficial as indicated by 24 of 33 (73%) respondents. This was also confirmed as it had the highest weighted average (Table 6). The easing of licensing restrictions was also highly rated and when ratings four and five (beneficial and extremely beneficial) were combined free/low license cost and easing of licensing restrictions were equally favoured (30). Although access to the source code to customize the software received the fourth highest rating as being extremely beneficial, it was almost as equally favoured as free/low license cost and easing of licensing restrictions when ratings four and five were combined.

Table 6: Perceptions on Benefits/Advantages of Using Open Source Software (OSS)

BENEFITS/ADVANTAGES	1. No Benefit	2.	3. No Strong Opinion	4.	5. Extremely Beneficial	TOTAL & (Weighted Average)
No vendor lock-in	2 (6%)	0 (0%)	9 (28%)	7 (22%)	14 (44%)	32 (3.97)
Development options available	2 (6%)	0 (0%)	6 (17%)	11 (31%)	16 (46%)	35 (4.11)
Easing of licensing restrictions (Can be used on multiple platforms without penalties)	1 (3%)	0 (0%)	4 (11%)	9 (26%)	21 (60%)	35 (4.40)
Cross platform functionality (Does not depend on specific hardware or operating system)	1 (3%)	1 (3%)	5 (14%)	9 (26%)	19 (54%)	35 (4.26)
Free/low license cost	0 (0%)	0 (0%)	3 (9%)	6 (18%)	24 (73%)	33 (4.64)
Access to the source code to customize the software	0 (0%)	1 (3%)	5 (14%)	12 (34%)	17 (49%)	35 (4.29)

4.2.7 Issues

Participants were asked to indicate what issues they may have experienced with the adoption of OSS. The issues were those that were most cited in the literature and included lack of staff with technical expertise, lack of documentation, lack of technical support, insufficient training, high maintenance costs and functionality issues. A total of 35 persons answered this question and 57% (20) indicated that lack of staff with technical expertise was the leading issue (Figure 8).

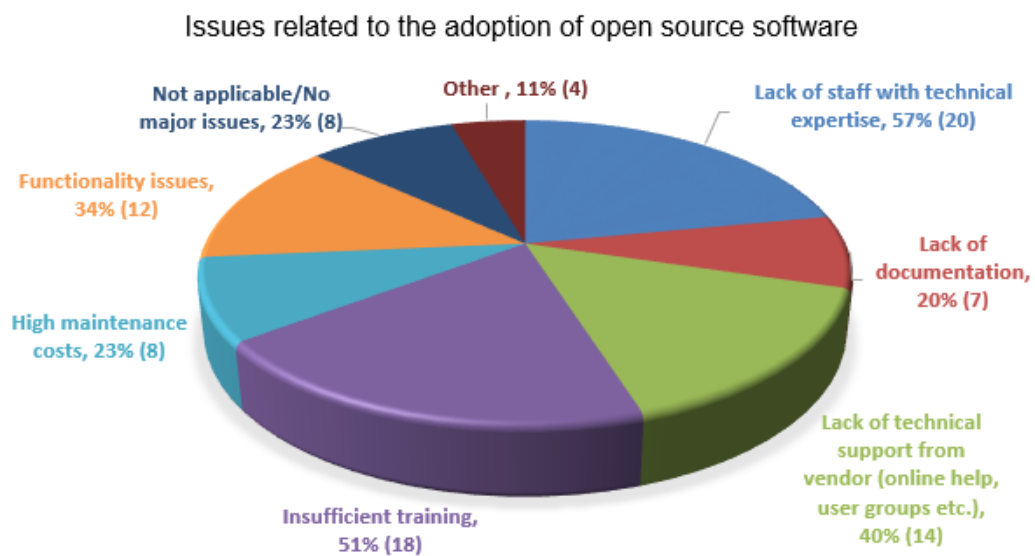


Figure 8: Issues related to the Adoption of Open Source Software (OSS)

Insufficient training followed closely (51%) as another important issue. Only 11% (4) indicated that either they did not experience any major issues or the question was not applicable. Some of the cited issues that were mentioned under the 'Other' option were high risks associated with hacking and financing for (apps) applications.

4.2.8 Awareness, Interest and Attitudes toward the value of Adopting OSS

A total of 36 persons answered this question. It sought to assess the awareness, interest and attitudes toward the adoption of OSS. Participants were asked to indicate their level of agreement with 12 statements (a-l) on OSS (Table 7).

Table 7: Awareness, Interest and Attitudes toward the value of Adopting OSS

STATEMENTS ABOUT OPEN SOURCE SOFTWARE (OSS)	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree	TOTAL & (Weighted Average)
a. The open source philosophy matches with libraries' mission and objectives in a broader sense.	7 (19%)	23 (64%)	6 (17%)	0 (0%)	0 (0%)	36 (4.03)
b. OSS are a good choice for libraries to adopt.	10 (28%)	22 (61%)	3 (8%)	1 (3%)	0 (0%)	36 (4.14)
c. OSS are economical technological solutions for libraries with limited budgets.	18 (50%)	15 (42%)	3 (1%)	6 (2%)	0 (0%)	36 (4.36)
d. Staff of libraries in Trinidad and Tobago are competent enough to implement OSS.	5 (14%)	11 (31%)	11 (31%)	7 (19%)	2 (6%)	36 (3.28)
e. OSS provides flexibility to customize, according to the local needs of libraries.	5 (14%)	22 (61%)	8 (22%)	1 (3%)	0 (0%)	36 (3.86)
f. OSS can promote an increase in staff expertise through the involvement in new developments.	8 (22%)	21 (58%)	4 (11%)	3 (8%)	0 (0%)	36 (3.94)
g. The level of technical knowledge needed to install and maintain OSS can be a barrier to its use.	12 (33%)	17 (47%)	5 (14%)	2 (6%)	0 (0%)	36 (4.08)
h. OSS is just as user friendly as commercial software.	2 (6%)	13 (37%)	11 (31%)	7 (20%)	2 (6%)	35 (3.17)
i. Large libraries are more likely to have staff with necessary skills and experience to implement OSS	6 (17%)	17 (47%)	6 (17%)	7 (19%)	0 (0%)	36 (3.61)
j. Support for OSS applications can vary and often depends on the user/developer community's commitment to the project.	9 (25%)	23 (64%)	3 (8%)	0 (0%)	1 (3%)	36 (4.08)
k. Low start-up cost associated with OSS is a main attraction to use.	10 (28%)	19 (53%)	5 (14%)	2 (6%)	0 (0%)	36 (4.03)
l. The OSS approach provides more flexibility and a better match to libraries' requirements.	4 (11%)	13 (36%)	16 (44%)	3 (8%)	0 (0%)	36 (3.50)

There was strong agreement by half of the respondents (50%) that OSS are economical technological solutions for libraries with limited budgets (statement c). This statement also received the highest weighted average. 64% of the respondents equally agreed that both the open source philosophy matches with libraries' mission and objectives in a broader sense (statement a) and that support for OSS applications can vary and often depends on the user/developer community's commitment to the project (statement j). Respondents only expressed strong disagreement to three statements (d, h, j) but these were either 3% or 6%.

Some respondents also indicated their views on OSS in statements shared under Question 18 – Further Comments about OSS. Those that relate to the heading are presented below:

“No encouragement to study and adopt, too bogged down in administrative

work; pitiable lack of executive support and executive interference in adoption of new technology.”

(Respondent 14)

“A great tool.”

(Respondent 25)

“OSS is the future of libraries.”

(Respondent 28)

“Absolutely necessary given the information that is needed and the state of the economy.”

(Respondent 30)

“With libraries being faced with diminishing resources, OSS may be the lifeline to keep libraries digitally connected.”

(Respondent 38)

4.2.9 Actions to Encourage Adoption of OSS

Respondents were asked to rank in order of priority what in their view were actions that may be necessary to encourage the adoption of OSS in their respective institution (if this was not already done) or at other libraries in Trinidad and Tobago. A total of 40 persons responded and they indicated that the first priority is to increase the awareness of the importance of OSS through workshops or vendor demonstrations (Figure 9). This action received the highest score (4.25). Other actions that were also closely ranked were to provide training courses (3.97) and to provide technical staff (3.94).

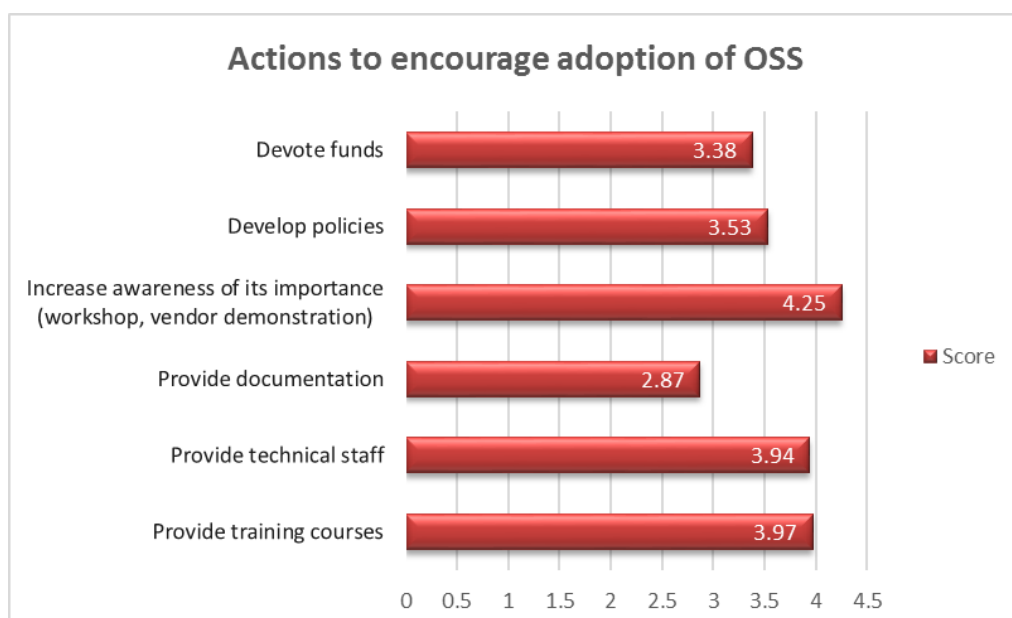


Figure 9: Actions to Encourage the Adoption of Open Source Software (OSS)

4.3 INTERVIEWS

4.3.1 Descriptive Data

The two interviewees indicated that they had over thirty years of experience as library and information professionals and both worked in special libraries. One interviewee had three members of staff while the other had twenty-three members spread amongst five libraries. Both interviewees had Master's degrees.

4.3.2 Knowledge and Usage of OSS

Interviewees indicated that their knowledge about OSS was obtained from print literature, websites and IT staff:

"Generally, just came across it in the literature and when I say literature, I don't necessarily mean only print literature but also on websites, you know library websites like UWI."

(Interviewee 1)

"I did research on the Internet and asked IT staff to review applications."

(Interviewee 2)

Both libraries were using DSpace as a digital library. One interviewee indicated that OSS usage at the library was relatively young:

"...I would say it's probably less than five years... And even then, ... because of all the other priorities, you may not get to it right away, I would say getting it and using it and developing the collection, you really talking two years."

(Interviewee 1)

4.3.3 Administration of OSS

4.3.3.1 Factors Influencing Adoption

Just like the survey respondents, interviewees indicated that some factors influenced their decision to adopt their current applications. A prime reason was cost and also the ability to customize the software as well as the availability of IT support. Other factors were then assessed based on specific needs. These included suitability, accessibility and ability to use multiple formats:

“Cost was a factor, ah mean if something is free, you will look at it. Armm, suitability was an even more important factor... I think another factor was the ability to customize. We wanted to be able to have something that we were not rigidly boxed into and that we could probably develop in some form or fashion down the road.”

(Interviewee 1)

“Cost was considered and also the availability of IT support”

(Interviewee 2)

4.3.3.2 Final Decision-Making Authority

Interviewees were asked who is the highest decision-making authority for implementing IT-related projects at their library. Although there were higher decision-making authorities such as an Executive Administrator or Library Committee, a consultative approach is adopted, that is, all relevant stakeholders are consulted before a final decision is taken.

4.3.3.3 Training

Interviewees were asked if specific training was conducted with staff as well as end users to facilitate present and long-term usage of the OSS solution. Interviewees indicated that training along with sensitization sessions were held and information about the product such as usage etc. was obtain from critically reading or accessing information online:

“Training wise, I went online and read. You know, like you go to the DSpace website and you sort of go and see what other libraries are doing on the web, using DSpace, but you looking at it with a different view now, you looking at with a more critical view. How you can use it, how you can organize your system. Armm, but training, I would say what we had was sensitization in that we asked one of the ICT people from UWI to come and give us a presentation on it.”

(Interviewee 1)

“Yes, with all staff. An IT staff member showed us how to use the product and explained its ins and out.”

(Interviewee 2)

In terms of training with end users, both interviewees indicated that this had not taken place as the software was primarily for in-house (staff) use.

4.3.3.4 Policy Formulation

Interviewees were asked if there were any policies/guidelines that were developed to guide the adoption of OSS (present or future) at their institution. Both respondents indicated that there were none.

4.3.4 Benefits

Interviewees were asked to indicate some of the benefits that their library and/or institution by extension have derived from the adoption of their current OSS solution. They shared that DSpace enabled easy access to resources and facilitated the location of material in one place:

“...the accessibility across the libraries is very important... It’s just that you have this geographic space and you don’t want to have to be duplicating things.”

(Interviewee 1)

“The online repository provides easy access to a number of resources that would otherwise be in hardcopy format.”

(Interviewee 2)

They were also asked if the source code was modified. Both respondents indicated that this had not yet taken place but would be done for future expansion.

4.3.5 Issues

4.3.5.1 Technical Support

Interviewees were asked if they experienced any issues with technical support during installation and for ongoing maintenance for their OSS solution. Both indicated that the installation process was successfully done by in-house IT/ICT staff and they also provided ongoing maintenance. One interviewee indicated that there were no major issues that were encountered with the software:

“I never experienced any trouble with it... I have not found any down time for DSpace to say that we had to, that we had a problem with it.”

(Interviewee 1)

The other interviewee indicated that some problems were experienced after installation and these were rectified by the in-house IT staff. The interviewee also shared that these support services are used about twice over a calendar year and that the library was satisfied with the level of service received:

“We encountered some problems at installation but these were quickly sorted out by the IT Unit...we may need them about twice over the course of a year and the service is prompt.”

(Interviewee 2)

4.3.5.2 Staff Expertise

Interviewees were asked if the technical knowledge/expertise required to install (set up) their OSS solution was readily available amongst their staff. They both said it was not:

“No one on staff had the technical knowledge to install the software but it was readily available in the organization...the IT Unit”

(Interviewee 2)

One interviewee added that in order to maximize the software’s full potential, it needs to be customized and this ability was not necessarily available amongst staff at the library as well as the ICT support staff:

“My IT staff, they are very good on firewalls and all those kind of things, networking, systems. Software, no. Ah mean they probably may know the main software, ... operating software, but anything else, no.”

(Interviewee 1)

This lack of expertise to customize the software was also identified by the other interviewee who noted it as one of the issues that has emerged following the adoption of DSpace:

“There is a need for someone with programming skills to customize the software to suit our needs.”

(Interviewee 2)

4.3.5.3 Documentation

Interviewees were asked if there was sufficient documentation available (manuals, guidelines etc.) on their chosen OSS. Only one interviewee’s response was in the affirmative:

“There was enough. I think there was enough for me to understand how does it work. Once it got too technical I did not read it because it did not make sense.”
(Interviewee 1)

“I did not find enough especially when we started looking at it...there were just a few websites that gave you general information.”
(Interviewee 2)

4.3.6 Lessons Learned

Interviewees were asked overall, what worked well, what didn't work as planned, and what the organization might do differently in the future. One response was a greater team effort should be used when undertaking such projects:

“...we probably did not do the right thing. I admit we did not do the right thing and a lot of it was a one man show rather a team getting together.”
(Interviewee 1)

4.3.7 Actions to Encourage Adoption of OSS

Interviewees were asked to identify what actions may be necessary to encourage libraries in Trinidad and Tobago to adopt OSS. One interviewee indicated that the information should be presented in a less 'techy way', that is a simpler format should be used:

“It is touted and presented and projected in a very IT way. If you go to a site you see the technical, you talk about programming. Those are the things that can frighten somebody who is not at all that way inclined and whereas if you said listen, this is a free software that you can use to do A, B C and D.”
(Interviewee 1)

Other actions were more visibility and the formation of user groups:

“I think a user group would be really nice, a Caribbean user group it don't have to be Trinidad only...I would like to see more visibility, more talking, more user groups, more collaboration.”
(Interviewee 1)

Interviewees were also asked if they would recommend OSS to another organization. One interviewee stated yes while the other indicated that maybe not OSS in general but certainly the specific solution being used (DSpace):

“Recommend is a big word. In other words, if you ask me would you recommend DSpace to somebody? I would say yes but if you tell me would you recommend open source software as a type of platform I don't think I could speak to it because I don't know enough about it and I have not seen enough other open source software.”

(Interviewee 1)

4.4 SUMMARY

The results showed that most of the survey respondents were librarians many of whom possessed a Master's degree as the highest qualification. Also, it was noted that many worked in libraries of varying sizes and the largest category of respondents were from academic libraries.

The results also revealed that many survey respondents knew about OSS. Those who were not aware and in the minority, indicated that it is an area they would like to explore in the future. In addition, many including the interviewees indicated that a reduction in cost was particularly beneficial with the adoption of OSS. But, some issues were also identified. The leading one was the lack of staff with expertise.

The results would now be discussed further in the next chapter.

CHAPTER 5: DISCUSSION

5.1 INTRODUCTION

This chapter analyzes simultaneously both results from the study (questionnaire and the interviews) in the context of the literature review, using some of the headings established in the preceding chapter. It concludes with a summary of the key points.

5.2 KNOWLEDGE AND USAGE OF OSS

The results showed that many library and information professionals (both new and experienced) have a basic knowledge about OSS. This means that they are aware of the availability and use of these tools. This may explain why inadequate knowledge was not cited as a reason for non-use of OSS by any survey respondent as was the case in Satpathy and Maharana (2012). Also, this result was certainly different from what was discovered by Rafiq and Ameen (2009) and Al Zeheimi et al. (2014) in their studies. In the former, it was observed that LIS professionals in Pakistan were not clear about OSS, its benefits, drawbacks and risks while in the latter, a lack of awareness was the main reason libraries in Oman (Middle East) were unable to implement OSS.

Some library and information professionals indicated that their knowledge of OSS was acquired principally through formal education/training while others stated that it was through self-study. These responses suggest that many of these professionals had either engaged in some aspect of continuing education or they were exposed to OSS through one of their courses while attaining their professional qualification. It was also encouraging to note that the small percentage (5%) who indicated that they did not know anything about OSS have expressed an interest in learning more in this area.

The results also showed that OSS solutions are being used in libraries to assist with library operations. The main ones are the development of digital libraries, automation and the management of archival content. Another observation was that

primarily academic libraries in Trinidad and Tobago are using OSS applications such as DSpace and Koha. The reason may be that these libraries have a greater staff compliment and therefore would have more time and resources to facilitate the adoption of OSS. This was also the opinion of some survey respondents (23 of 36) who agreed or strongly agreed that large libraries are more likely to have staff with necessary skills and experience to implement OSS (Statement i, Table 7, Chapter 4).

However, the results also showed that although OSS is being used in libraries, this is not widespread as most of the survey respondents indicated that they were not currently using any OSS solutions. Most of the non-users of OSS were using proprietary software and these libraries may have decided to continue to do so as they may be fairly content with their current application or do not envision additional benefits such as significant cost savings. Another possible reason may be that they anticipate great difficulty with an OSS alternative in terms of migration and maintenance as stated by most of the respondents in a research study on OSS integrated library systems (Singh, 2013). This resulted in a lack of motivation to change systems.

5.3 BENEFITS

Just like many authors (Jaffe and Careaga, 2007; Cervone, 2003; Poynder, 2001) several respondents agreed (64%) or strongly agreed (19%) that the open source philosophy matches with libraries' mission and objectives in a broader sense, namely freedom of access, communal action/collaboration and openness. In addition, an increase in computing flexibility was viewed to be very beneficial to libraries as the OSS model according to Cervone (2003) can provide an easing of licensing restrictions and cross-platform simplicity.

In terms of the availability of development options or access to the source code to customize the software to meet local needs as identified by Hasan (2009), these benefits were not fully explored. Although these were rated fairly highly as being beneficial, it is not very clear if all the current users have utilized these capabilities as was done by special libraries in Australia (Keast, 2011) that switched to OSS due to

lack of flexibility to achieve customizations. Only the two interviewees were specifically asked if the source code was modified and both indicated that they may exercise this option in the future, once the expertise to do so is available on staff.

Also, of the six benefits that were provided for survey respondents to share their views on, no vendor lock-in cited by Grant (2008) as a benefit that allows libraries to remain in control of the decision to upgrade or migrate was the least favoured. It received a weighted average of under four while the other benefits ranged from 4.11 to 4.64 (Table 6, Chapter 4). This 'benefit' also had the highest neutral rating (no strong opinion). This suggests that perhaps some respondents may not have considered this as particularly important at this time.

On the other hand, cost was cited as an important benefit both by survey respondents and interviewees. This has also been reiterated by other authors (Payne and Singh, 2010; Breeding, 2009) who note that OSS can be an alternative solution for libraries faced with financial constraints. For the latter group and the survey respondents using OSS, it was a prime reason that influenced their decision to adopt their chosen OSS. This was also the deciding factor for Australian special libraries considering a switch to OSS (Keast, 2011) and libraries in the United States considering a migration to OSS ILS (Singh, 2013). Many of the other survey respondents (24 of 33) also rated cost, particularly free or low license cost as being extremely beneficial (Table 6, Chapter 4). Free software cost was also seen as the most beneficial in Dalling's study which investigated attitudes towards open source library management systems in UK higher education libraries (2011). Many also opined that low start-up cost associated with OSS is a main attraction to use (Statement k, Table 7, Chapter 4). This meant that if these libraries were to adopt OSS, they should be able to deploy funds in other areas (Corbly, 2014) and thus make maximum use of their budgetary allocation unlike their counterparts who were currently using proprietary software.

5.4 ISSUES

Despite the benefits, the results showed that there were a number of factors or

issues that may prevent a wider adoption of OSS. The main issue of a lack of staff with technical expertise, that was identified by both survey respondents and interviewees was also a major issue in some of the studies that were examined in the literature (Maua and Mwiti, 2013; Singh, 2013; Rafiq and Ameen, 2009; Hoy and Koopman, 2008). This means that current users would be unable to enjoy the full benefits of the software unless this is addressed and it may serve as a barrier to those who may be interested in the adoption of OSS as was the case with academic libraries in South Africa (Hoy and Koopman, 2008). Possible solutions are the employment of suitably qualified personnel with the requisite skill, the upgrading of skills of current staff (competency building) or the outsourcing of the skills through an appropriate vendor. However, whatever is decided, some level of funding or as Clarke (2000) puts it 'a shift in budgeting priorities' would be required. It has been recommended that this should be part of any library's overall assessment of TCO if it wants to adopt OSS.

The other highly rated issue which was insufficient training should also be an area of priority. Just as was stated above with the main issue, the full potential of the software may not be realized. Rafiq and Ameen (2009) suggest that before initiating an OSS project, a proper and intensive training programme should be mapped out. Thus, consideration would need to be given to the adoption of short-term and long-term measures such as allowing staff (particularly support staff) to attend short courses/conferences or participate in webinars/workshops that can provide hands-on experiences. The latter was cited as the mode of training that would be most helpful to encourage adoption of OSS (Hanumappa, Dora and Navik, 2014). This was also evident from the results as it was the most popular mode for acquiring knowledge about OSS. Library professional are also encouraged to undertake certificate or higher qualification programmes that improve technical skills and competencies as it was noted that poor computer expertise of librarians was a barrier to wider acceptance of open source systems in libraries (Rafiq and Ameen, 2009). Armed with these new skills, they would have the ability to contribute and modify OSS, a current barrier to its adoption or contribute to the OSS community by writing documentation that is more user-friendly.

The lack of technical support which was also a frequent critique of OSS in the literature (Petrich, 2009; Ho, 2007; Chawner, 2004) was the third highest issue according to some survey respondents (Figure 8, Chapter 4). However, as Pytai (2009) points out, this may not be the case for larger libraries with skilled systems staff who may have the requisite technical expertise. It may also be the case for those who may be able to source help from other staff within their parent organization. The latter was the experience of one of the interviewees but Pytai's claim could not be confirmed in the current study as an examination of individual responses of persons who indicated that their staff compliment was 16 and more did not necessarily bear this out. It is believed that additional data would need to be collected to verify this.

It was also interesting to note that a lack of documentation was not highly rated as an issue by survey respondents (only 7 of 35) and one of the interviewees as was the case with some studies (e.g. Murray, 2002). This may have been so because of an improvement in the quality of the documentation since the time these studies were conducted. A similar observation was made about high maintenance costs which was cited by only eight of the survey respondents as an issue. This could mean that many of the respondents were able to realize this costing aspect as a benefit rather than an issue.

Another factor that may serve as a discouragement to the wider adoption of OSS and which was cited as a reason for current non-use is a lack of management support. This was the case in Satpathy and Maharana (2012, p. 424) in which over 90% of the respondents (total was 143), indicated that lack of support from authority was the main reason for not using OSS to create a digital library or institutional repository. It was also the second highest reason for the non-implementation of OSS in libraries of Oman (Al Zeheimi et al., 2014). In addition, one of the survey respondents indicated this under 'Further Comments about OSS'. This lack of support may be because these key decision-makers lack the requisite knowledge about OSS alternatives in terms of their value and benefits. If this is the case, efforts can be made to remedy this by providing them with this information through presentations, proposals or reports so that informed decision-making can be done.

5.5 PERCEPTIONS ABOUT OSS

Based on the findings about the benefits and issues (perceived and actual) some perceptions about OSS can be determined. Overall, there is a positive perception about OSS as most of survey respondents expressed strong or very strong levels of agreement with many of the statements about OSS (Table 7, Chapter 4). These statements were related to benefits, issues etc. that were expressed by researchers. Some included 'the OSS philosophy matches with libraries' mission and objectives in a broader sense', 'support for OSS applications can vary and often depends on the user/developer community's commitment to the project', 'OSS are a good choice for libraries' and 'OSS provides flexibility to customize, according to the local needs of libraries'.

Similar results were obtained by Rafiq (2009) in his study which sought to determine LIS community's perception towards open source adoption in libraries. This positive trend was also noted from the views expressed about the six benefits that were most cited in the literature (Table 6, Chapter 4). It therefore means that there is a perception that OSS can provide significant economical and technological benefits to libraries in Trinidad and Tobago. This can lay the foundation for raising awareness about the potential value of OSS and for its wider adoption in libraries in Trinidad and Tobago.

However, notwithstanding this, library and information professionals have some reservations. This was in terms of their ability to implement OSS and the ability of OSS to be just as effective as proprietary software. This was evident from some of them having no opinion on or some disagreement with statements such as 'staff of libraries in Trinidad and Tobago are competent enough to implement OSS', 'OSS is just as user-friendly as commercial software' and 'the OSS approach provides more flexibility and a better match to libraries' requirements' (Statements d, h, i, Table 7, Chapter 4).

5.6 ACTIONS TO ENCOURAGE ADOPTION OF OSS

To encourage the adoption of OSS and to change neutral or low opinions about its value as noted above, a plan of action should be embarked upon. The first priority, as suggested by respondents should be to increase awareness of the importance of OSS and this can be done formally through specially planned workshops or presentations at LATT meetings and informally through conversations (including social media) with other colleagues. This would set the stage for other actions that individual libraries can undertake such as the provision of training courses for staff, allocation of funds for implementation, use and maintenance of OSS and the development of policies and guidelines that would provide a framework to support the use of OSS, to guide the overall implementation process and help the adoption to be placed and viewed as part of the library's overall strategic plan. Further activities include the establishment of partnerships and user groups.

5.7 SUMMARY

The results showed that OSS is known and is perceived as "a great tool". However, its use in libraries in Trinidad and Tobago is not very extensive and the level of adoption can be described as low. This mirrors the findings of studies from developing countries such as India, Pakistan and Africa. Although users have been able to enjoy some of its benefits such as free/low license cost, they have also been faced with issues chief of which is a lack of staff expertise. This issue has limited their exploitation of the software's full capabilities. But the challenges can be resolved and non-users can also be encouraged to embrace the technology to enhance their libraries' operations. This can be done by adopting an organized approach inclusive of workshops, the provision of training courses, technical staff as well as the development of policies and the commitment of funding. Additional activities include the establishment of partnerships and user groups.

CHAPTER 6: CONCLUSION

6.1 INTRODUCTION

This chapter reviews the aim of the study to determine if it was accomplished and if the specific research questions were answered. It also reviews the main themes of the literature review and reflects on the research methods. Finally, it summarizes the findings from the study and makes generalizations to the sector. Recommendations are also provided and other possible areas for research are suggested.

6.2 REVIEW OF AIM AND RESEARCH QUESTIONS

The principle aim of this study was to investigate the state of adoption of open source software (OSS) in libraries in Trinidad and Tobago by answering the following research questions:

- What is the extent of use of open source software in libraries in Trinidad and Tobago?
- What are the benefits or advantages of using open source software generally and in the context of Trinidad and Tobago?
- What are the key issues related to the adoption of open source software generally and as it relates to the Trinidad and Tobago environment?
- What are the levels of awareness, interest and attitudes towards the value of adopting open source software among library and information professionals in Trinidad and Tobago?

The answers to these questions were obtained and are outlined under the various headings that follow.

6.3 REFLECTIONS ON LITERATURE REVIEW

A review of the literature provided the overall background for the study and enabled

the determination of the benefits or advantages of using OSS and with the identification of key issues related to the adoption of OSS generally. This provided partial answers to two research questions (second and third). The search revealed that OSS and libraries share some ideological similarities and they provide benefits such as cross-platform simplicity, easing of licensing restrictions, bridging of the digital divide, customization options, reduction of vendor lock-in and a lowering of cost or more efficient use of financial resources. It also revealed that although OSS offer a range of advantages, there are some issues that were encountered. These included technological/technical issues such as the level of support available, the need for training and documentation. Also, issues related to the lack of clarity or knowledge about OSS and social/cultural issues such as a lack of a culture of collaboration and sharing.

6.4 REFLECTIONS ON METHODOLOGY

The research used a mixed methods approach to answer different aspects of the research questions. Quantitative data was gathered using an online questionnaire to help determine the extent of use of OSS, the benefits of using OSS within the Trinidad and Tobago environment as well as levels of awareness, interest and attitudes towards the value of adopting OSS. Semi-structured interviews were used to collect the qualitative data that explored in a greater depth the issues related to adoption and to fill any gaps from the quantitative method.

A stratified sample was to be drawn from the population which comprised of the LATT membership and these professionals were to be the only ones receiving the online survey. However, this did not happen and the entire membership (175 members) was surveyed. This presented some limitations. One was that the response rate was only about 25% and this may not have been high enough to confidently generalize to the entire population according to some researchers. Issues were also experienced with the interviews as only two out of a proposed five were conducted. It is believed that the additional responses would have enhanced the findings and improved its validity. Nevertheless, the results of the study can be generalized to the

wider population as sampling errors were eliminated as the entire population was surveyed and reliability and validity were achieved by documenting procedures and using multiple forms of data collection.

6.5 SUMMARY OF FINDINGS

The findings revealed that although there is a relatively high level of awareness of OSS, not many libraries in Trinidad and Tobago have adopted this type of software. The prime factor identified by current users of OSS that have influenced their adoption of the technology was related to cost. Potential users also viewed this as an important advantage as most of them cited free/low license cost as being the most beneficial with the adoption of OSS. On the other hand, the main issue identified by current users and other survey respondents was a lack of staff with technical expertise. This resulted in the underutilization of one of its benefits, an ability to customize the software.

In terms of their levels of interest in the value of adoption of OSS, library and information professionals in Trinidad and Tobago that were not aware of OSS have indicated that it is an area they would like to explore in the future. Also, the strong and high levels of agreement to statements such as 'OSS are a good choice for libraries to adopt' and 'OSS provides flexibility to customize, according to the local needs of libraries' indicate that library and information professionals have a high perception of the value of adopting OSS. However, there are some neutral and dissenting 'voices' and these professionals need to be convinced that as one respondent sums it up "OSS is the future of libraries."

6.6 RECOMMENDATIONS

In this regard, the following suggestions are made to improve the adoption of OSS in libraries in Trinidad and Tobago:

- Workshops should be conducted to educate and sensitize library and information professionals about OSS. These can be conducted by the

professional body (LATT).

- OSS documentation should be simplified and made more user-friendly, particularly documentation required for customization and data migration. Current users can contribute to this activity.
- Partnerships or collaborations should be forged or established amongst users of OSS to develop specific software and to standardize customizations.
- A local OSS user group should be established (that is within Trinidad and Tobago) to help with the resolution of issues.
- Libraries that intend to adopt OSS should be aware that lack of staff to customize the software is a critical challenge and put mechanisms in place such as training courses to eliminate or reduce its effects.
- Funds should be allocated for the implementation and maintenance of any OSS project.
- A policy framework should be developed to guide the implementation of OSS.

6.7 FUTURE RESEARCH

As was noted, some elements of the study were not fully determined because of insufficient data. One of the areas that can be researched in the future is a case study to determine the costs involved (TCO) in moving from a proprietary system to a similar OSS system to measure cost effectiveness. Another would be to conduct a longitudinal study after some workshops on OSS have been conducted to determine if adoption levels have changed.

6.8 SUMMARY

This study has been able to shed some light on the current state of adoption of open source software in libraries in Trinidad and Tobago. It has shown that OSS is being used for various purposes to enhance library operations but there is a low level of adoption. However, there is a vast scope for its use in the future as the level of

interest and attitudes towards OSS are fairly high. To expand this 'buy in', there is need for a well-planned course of action and some 'champions' to advocate the cause and to encourage its adoption. The academic community along with the LATT may well be the ones to initiate this action as they have professionals who are knowledgeable and have had positive experiences. In light of the current economic climate, libraries may be more willing to explore such alternatives when faced with further budgetary restrictions. Therefore, it is felt that a move in this direction would no doubt be very timely.

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APPENDIX A: MAPS OF CARIBBEAN AND TRINIDAD AND TOBAGO



Map of the Caribbean Sea and its islands

Source: Krusser (Own work, all data from Vector Map.) [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)], via Wikimedia Commons



The Islands of Trinidad and Tobago

Source: By User:(WT-shared) Burmesedays, Perry-Castañeda Library Map Collection Trinidad and Tobago map (image:Trinidad_and_Tobago_Regions_map.svg) [CC BY-SA 3.0] <http://creativecommons.org/licenses/by-sa/3.0>], via Wikimedia Commons

APPENDIX B: CATEGORIES OF MEMBERSHIP IN THE LIBRARY ASSOCIATION OF TRINIDAD AND TOBAGO

Article 1 MEMBERSHIP

2. Membership will be in the following categories:

(i) **Personal** - This category of membership is open to any qualified library and information professional engaged in the promotion and practice of Library and Information Science and its related fields in Trinidad and Tobago.

(ii) **Institutional** - This category of membership is open to any library, archive, information and documentation centre or related organisation in Trinidad and Tobago.

(iii) **Associate** - This category of membership is open to library assistants, library technicians and any other person in Trinidad and Tobago not eligible for personal membership but connected with and/or interested in the promotion of library and information science and services and its related fields.

(iv) **Student** - This category of membership is open to any student in Trinidad and Tobago enrolled in a programme of Librarianship, Library or Information Science or Information-related programme.

(v) **Honorary** - This category of membership may be conferred on any personal member of the Association who has made a substantial and recognisable long-standing contribution to the Association, the library and information profession or libraries and library services.

(vi) **Corresponding** - This category of membership is open to any person, institution, organisation or association described in paras. (i), (ii), (iii) (iv) or (vii) and not being resident or situate in Trinidad and Tobago.

(vii) **Retired** - This category of membership is open to:

i) Retired (Personal): any retired, qualified library and information professional who engaged in the promotion and practice of Library and Information Science and its related fields who resides in Trinidad and Tobago

ii) Retired (Associate): any retired library assistants, library technicians and any other retired person who resides in Trinidad and Tobago not eligible for personal membership but connected with and/or interested in the promotion of library and information science and services and its related fields.

APPENDIX C: LITERATURE SEARCH PLAN TEMPLATE

KEY WORDS AND PHRASES	SOURCES AND RESULTS										
	Abstracts	Search Engines	Digital Libraries		Online Catalogues		IR/Theses	E-Books			
	Google Scholar	Google	JSTOR	IEEE Xplore	E-LIS	PRIMO	Alma Jordan Library (UWI)	CADAIIR	Shodhganga (Indian theses)	ProQuest eBook Central	Dawsonera
Open source software											
Open source											
OSS											
Free software											
Free and open source software											
FLOSS											
FOSS											
Adoption of OSS / Open source etc. / in libraries											
Use / Usage of OSS / Open source etc. in library /libra*											

APPENDIX D: GENERAL PUBLIC LICENSE (GPL) CRITERIA

1. **Free Redistribution:** The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.
2. **Source Code:** The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost—preferably, downloading via the Internet without charge.
3. **Derived Works:** The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.
4. **Integrity of the Author's Source Code:** The license may restrict source code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code.
5. **No Discrimination Against Persons or Groups:** The license must not discriminate against any person or group of persons.
6. **No Discrimination Against Fields of Endeavor:** The license must not restrict anyone from making use of the program in a specific field of endeavor.
7. **Distribution of License:** The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.
8. **License Must not be Specific to a Product:** The rights attached to the program must not depend on the program's being part of a particular software distribution.
9. **The License Must not Restrict Other Software:** The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.
10. **The License must be Technology-Neutral:** No provision of the license may be predicated on any individual technology or style of interface.

APPENDIX E: POPULAR OSS USED IN LIBRARIES

TYPE OF OSS	NAME OF SOFTWARE/APPLICATION
Operating System	Linux
Web Server	Apache
Relational database that powers most web based applications	MySQL
Office Suite	OpenOffice
Internet Browser	Firefox
Content Management Systems (used to manage workflow needed to collaboratively create, edit, review, index, search, publish and archive various kinds of text)	Drupal
OPAC	Vufind
Federated Searching	Library Find
Integrated Library (Management) Systems - Assist libraries in carrying out house-keeping activities such as cataloguing, acquisitions, circulation, serials control etc.	Koha, Evergreen
Digital Libraries and Institutional Repositories - Established for capturing and preserving intellectual output or special collections	DSpace, Greenstone, EPrints

APPENDIX F: SAMPLE OF QUESTIONNAIRE

1. General

The principle aim of the study is to investigate the state of adoption of open source software (OSS) in libraries in Trinidad and Tobago. It is hoped that the research would provide libraries with practical information on the benefits as well as the key issues related to the adoption of OSS. Thank you in advance for your time and contribution.

1. What type of library do you work in?

- Academic
- Public
- School
- Special
- Other (please specify)

2. How many members of staff work at your institution? (Exclude numbers from parent institution such as university, school, court etc. if applicable)

- 1 – 5
- 6 – 10
- 11 – 15
- 16 or more

3. Please indicate your designation/position. (Librarian, Systems Librarian etc.)

4. What is your highest level of professional qualification? (To help assess professional skills and competencies)

- Doctorate
- Master's Degree
- Bachelor's degree
- Other (please specify)

5. Please indicate your years of experience as a library and information professional.

- 1-5 years
- 6-10 years
- 11-15 years
- More than 15 years

2. Knowledge and Usage

6. Please indicate the extent of your knowledge of open source software (OSS). (Partially known means have basic information about OSS; Known means aware of OSS and its benefits but have not used any applications; Fully known means very familiar with OSS and its benefits and effectively uses specific OSS applications/solutions).

- Not known If chosen, directed to Question 7
- Partially known
- Known
- Fully known

3. Knowledge and Usage Cont'd

7. If you have never heard about OSS would it be an area you would like to explore in the future?

- YES If chosen, directed to Question 17
- NO If chosen, directed to End of Survey

4. Knowledge and Usage Cont'd

8. Based on your knowledge of OSS, how was this acquired? Please select the primary method.

- Formal education/training (e.g course/workshop) Self study
- From colleagues/friends Vendor demonstration
- Trial and error
- Other (please specify)

9. Are you currently using any OSS solutions (eg. Koha, DSpace)?

- YES
- NO If chosen, directed to Question 13

Question Modified from Dalling (2011)

5. Knowledge and Usage Cont'd

10. Please state briefly what is being used and for what purpose.

11. Were there any factors (such as cost and support) that influenced your decision to adopt your current OSS solution?

- Yes (Please summarize below)
- No

(Please specify factors)

12. Was training conducted to facilitate present and long-term usage of OSS?

- Yes
- No
- Not Sure

6. Knowledge and Usage Cont'd

13. Please select the most applicable reason for not currently using any OSS solutions.

- Currently using proprietary software
- Lack of management support
- Inadequate knowledge, documentation etc.
- Other (please specify)
- Too risky
- Lack of expertise
- Not required at this time

7. Benefits and Issues

14.

Question Modified from Dalling (2011)

Listed below are some of the most cited benefits/advantages experienced when using open source software. Please indicate how beneficial each has been or would be to your institution, on a scale of 1-5 (where 1 is of No Benefit and 5 is Extremely Beneficial). Please select ONE option for each statement.

	1. No Benefit	2.	3. No Strong Opinion	4.	5. Extremely Beneficial
No vendor lock-in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Development options available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Easing of licensing restrictions (Can be used on multiple platforms without penalties)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cross platform functionality (Does not depend on specific hardware or operating system)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Free/low license cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Access to the source code to customize the software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. Listed below are some of the most cited issues related to the adoption of open source software. Please select any you may have experienced. You can select multiple options.

- Lack of staff with technical expertise
- Lack of documentation
- Lack of technical support from vendor (online help, user groups etc.)
- Insufficient training
- High maintenance costs
- Functionality issues
- Not applicable/No major issues
- Other (Please summarize)

8. Interest, Perceptions and Attitudes

Question Modified from Rafiq (2009)

16. Please select the option that corresponds to your level of agreement with each statement.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
a. The open source philosophy matches with libraries' mission and objectives in a broader sense.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. OSS are a good choice for libraries to adopt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. OSS are economical technological solutions for libraries with limited budgets.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Staff of libraries in Trinidad and Tobago are competent enough to implement OSS.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. OSS provides flexibility to customize, according to the local needs of libraries.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
f. OSS can promote an increase in staff expertise through the involvement in new developments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. The level of technical knowledge needed to install and maintain OSS can be a barrier to its use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. OSS is just as user friendly as commercial software.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Large libraries are more likely to have staff with necessary skills and experience to implement OSS.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Support for OSS applications can vary and often depends on the user/developer community's commitment to the project.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Low start-up cost associated with OSS is a main attraction to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. The OSS approach provides more flexibility and a better match to libraries' requirements.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Future Prospects

17. From the list below please rank in your view in order of priority, the actions that may be necessary to encourage the adoption of OSS in your institution (if applicable) or other institutions in Trinidad and Tobago, where 1 is the highest priority.

<input type="text"/>	Provide training courses
<input type="text"/>	Provide technical staff
<input type="text"/>	Provide documentation
<input type="text"/>	Increase awareness of its importance (workshop, vendor demonstration)
<input type="text"/>	Develop policies
<input type="text"/>	Devote funds

18. Please add any further comments about OSS here:

APPENDIX G: SAMPLE OF LETTER REQUESTING PERMISSION TO USE/MODIFY QUESTIONS

Use of Open Source Software in Libraries in Trinidad and Tobago: an exploratory study

Research project for Master's Dissertation MSc (Econ) Management of
Library and Information Services
Department of Information Studies, Aberystwyth University, Wales

Dear Sir,

My name is Sheryl Washington-Vialva and I am currently pursuing an MSc (Econ) Management of Library and Information Services by distance learning at Aberystwyth University, Wales. As part of my course, I am undertaking a research project under the supervision of Dr. Allen Foster (Reader in Information Science, Department of Information Studies) entitled **Use of Open Source Software (OSS) in Libraries in Trinidad and Tobago: an exploratory study**.

This research seeks to determine the current state of adoption of open source software (OSS) solutions in libraries in Trinidad and Tobago, whether it is being used for housekeeping operations, collection management, digital preservation, reference services or for some other purpose. It also strives to assess the levels of awareness, interest and attitudes towards the value of adopting open source software among library and information professionals in Trinidad and Tobago. It is hoped that the research would provide libraries in Trinidad and Tobago with practical information on the benefits as well as the key issues related to the adoption of OSS, drawn from experiences in their present local context.

I am requesting your permission to use (that is, modify) some of the questions from your survey re Dissertation entitled *Open source, open minds? An investigation into attitudes towards open source library management systems in UK higher education libraries* submitted to Aberystwyth University in 2011. This would assist me greatly with my research. The specific questions are identified in the attached Appendix.

If permission is granted, I will ensure that you are acknowledged as the source and the requisite permission was obtained. I look forward to your early response.

Regards,

Sheryl Washington-Vialva

[Contact Information]

APPENDIX H: SAMPLE OF CONSENT LETTER TO LIBRARY ASSOCIATION OF TRINIDAD AND TOBAGO

**Research project: Use of Open Source Software in Libraries in Trinidad and Tobago:
an Exploratory Study**

President
Library Association of Trinidad and Tobago

Dear Madam

Request for Permission to Distribute Questionnaire

I am currently pursuing a Master's in Management of Library and Information Services by distance learning at Aberystwyth University, Wales. As part of my course, I am undertaking a research project entitled **Use of Open Source Software (OSS) in Libraries in Trinidad and Tobago: an Exploratory Study** under the supervision of Dr Allen Foster, Reader in Information Science, Department of Information Studies.

This research seeks to determine the current state of adoption of open source software (OSS) solutions in libraries in Trinidad and Tobago, whether it is being used for housekeeping operations, collection management, digital preservation, reference services or for some other purpose. It also strives to assess the levels of awareness, interest and attitudes towards the value of adopting open source software among library and information professionals in Trinidad and Tobago. It is hoped that the research would provide libraries in Trinidad and Tobago with practical information on the benefits as well as the key issues related to the adoption of OSS, drawn from experiences in their present local context.

I am therefore seeking permission to have a questionnaire distributed to members of the Library Association, particularly, personal members as these professionals would be the ones most relevant to the research. If it is not possible to distribute to these specific professionals, then the wider membership would suffice. Participation will be voluntary and totally anonymous. In addition, the information provided by participants will be kept securely, and for only as long, as is necessary to: a) analyze the research data and b) report on the research and its findings. A summary of the research findings can be made available to the Association once this is requested.

If permission is granted, I will send for distribution an invitation to participate and a link to the questionnaire.

If further information is required, my contact details are below.

I look forward to hearing from you.

Best regards,

Sheryl Washington-Vialva

[Contact Information]

July 31, 2017

APPENDIX I: SAMPLE OF INVITATION LETTER TO PARTICIPANT

(Note: Contact Information such as email addresses, etc. removed to ensure confidentiality)

Research project: Use of Open Source Software (OSS) in Libraries in Trinidad and Tobago: an Exploratory Study

Dear Participant,

I am currently pursuing a Master's in Management of Library and Information Services by distance learning at Aberystwyth University, Wales. As part of my course, I am undertaking a research project which seeks to determine the current state of adoption of open source software (OSS) solutions in libraries in Trinidad and Tobago. This research is being carried out under the supervision of Dr Allen Foster, Reader in Information Science, Department of Information Studies.

I would be very grateful if you would take the time to complete this survey as it would assist me greatly with this research. It will take approximately 20 minutes or less to complete and will be available until **Friday, September 15, 2017**. If you choose to take part in this research, please note the following:

- Your participation in this study is entirely voluntary and the information you provide will be totally anonymous.
- Your direct quotes (that is, statements you might write on the questionnaire) will be anonymized in the study's report/write-up.
- The information will be kept securely, and for only as long as is necessary to: a) analyze the research data and b) report on the research and its findings.

Thank you in advance for your time and contribution. If you have any questions, please contact me by email at [email address] or my supervisor at [email address].

Sheryl Washington-Vialva

Student

August 21, 2017

LINK TO QUESTIONNAIRE



<https://www.surveymonkey.com/r/QMVJN3M>

APPENDIX J: SAMPLE OF INTERVIEW GUIDE

Use of Open Source Software (OSS) in Libraries in Trinidad and Tobago

Interview Guide

Introduction

Thank you for agreeing to be interviewed. This interview is intended to explore the benefits and key issues that are associated with the adoption of open source software. I also wish to confirm that you have consented to have this interview recorded.

General

1. What type of library do you work in?
2. How many members of staff work at your institution?
3. What is your designation/position?
4. What is your highest level of professional qualification?
5. How many years of experience do you have as a library and information professional?

Administration

6. Who is the decision-making authority for implementing IT-related projects in your library?
7. Were there any factors (such as cost and support) that influenced your decision to adopt your current OSS solution?
8. Were there any policies/guidelines developed to guide present or future adoption of OSS at your institution?

Knowledge and Use of Open Source Software (OSS)

9. How did you learn about OSS?
10. What type of OSS solution are you using at your library?

Training

11. Was specific training conducted with you and/or other staff to facilitate present and long-term usage of the OSS solution?
(a) Was training conducted with end users? If so, is this an ongoing exercise?

Benefits

12. What are some of the benefits that your library and/or institution by extension have derived from the adoption of your current OSS solution?
13. One of the benefits of OSS that has been identified is access to the source code to customize the software. Has this been beneficial to your institution? (or Have you modified the source code?)

Issues

Technical support

14. The lack of technical support (during installation and for ongoing maintenance) has been a frequent critique of OSS, has this been your experience?

(a) After installation, did you experience any issues/problems with your OSS? If so, how did you get help?

(b) What support services have you used for maintenance? (In-house, external, etc.)

(c) How many times over the course of a calendar year have you used these support services?

(d) Are you/Were you satisfied with the technical support you have received?

(e) If no, how can this support be improved?

15. What technical knowledge/expertise was required to install (set up) your current OSS solution (name of solution would be used)?

(a) Was this knowledge/expertise readily available amongst your staff?

(b) Do you think that this (the level of technical knowledge needed to install and maintain OSS) can be a barrier to its use?

Documentation

16. Was there sufficient documentation available (manuals, guidelines etc.) on your chosen OSS?

Other Issues

17. What are some of the (other) main issues that you have identified following the adoption of OSS?

Lessons Learned

18. Overall, what worked well, what didn't work as planned, and what might your organization do differently in the future?

Future Prospects

19. Do you have plans to adopt other OSS solutions or to be engaged in any developmental projects re OSS? (Do you have plans for future enhancements?)

20. Do you believe that OSS can be a viable economical alternative to proprietary software? (That is, despite the real costs involved in the development, maintenance, and use of OSS software these are lower than those associated with use of commercial software)

21. Would you recommend OSS to another organization?

22. For libraries in Trinidad and Tobago that have not yet adopted OSS, what actions may be necessary to encourage them to do so?

Closing

23. Do you have any further comments about OSS?

Thank participant.

APPENDIX K: SAMPLE OF CONSENT LETTER FOR INTERVIEW

(Note: Contact Information such as email addresses, etc. removed to ensure confidentiality)

Research Project: Use of Open Source Software in Libraries in Trinidad and Tobago: an Exploratory Study

Dear

Thank you for agreeing to participate in an interview. The interview should take no more than 30 minutes.

Please find attached a copy of the interview guide which outlines the areas that would be focused on in the interview.

The research is being undertaken as part of my Master's dissertation and is being carried out under the supervision of Dr Allen Foster, Reader in Information Science, Department of Information Studies, Aberystwyth University, Wales.

It seeks to determine the current state of adoption of open source software (OSS) solutions in libraries in Trinidad and Tobago, whether it is being used for housekeeping operations, collection management, digital preservation, reference services or for some other purpose. It also strives to assess the levels of awareness, interest and attitudes towards the value of adopting open source software among library and information professionals in Trinidad and Tobago. It is hoped that the research would provide libraries in Trinidad and Tobago with practical information on the benefits as well as the key issues related to the adoption of OSS, drawn from experiences in their present local context.

Please note that the information you provide will be kept securely, and for only as long, as is necessary to: a) analyze the research data and b) report on the research and its findings. In addition, your direct quotes (that is, statements you make during the interview) will be anonymized in the study's report/write-up.

Please confirm your agreement by sending a response to this email using the address listed at the bottom. Please include the following in the body:

"I have read and understood the information concerning the research and I have consented to be interviewed. I also wish to confirm that I have given my consent to have the interview recorded."

Thank you.

Best regards,

Sheryl Washington-Vialva

[Contact Information]

September 20, 2017

APPENDIX L: SAMPLE OF INTERVIEW TRANSCRIPT WITH CODING

Researcher (R): Were there any factors (such as cost) that influenced your decision to adopt your current OSS solution?

Interviewee (I): Cost was a factor, ah mean if something is free, you will look at it. Armm, suitability was an even more important factor. Armm, for us, there were other factors why we went looking. One is, we wanted something that would be accessible across all the libraries, the geographical space. We wanted one place to house our growing digital acquisitions and we were looking for a digital repository/mechanism that would be able to manage multiple formats - so images, not just text. Those were the main factors that were on our minds when we said OK what we looking for. But let me just also say that the main integrated typical library services/operations – like circulation, you know housing the catalogue that kind of thing, we already have a main software platform for that, so that was not our focus, our focus was on these other things, but to compliment them. Pause and I think another factor was the ability to customize. We wanted to be able to have something that we were not rigidly boxed into and that we could probably develop in some form or fashion down the road.

R: Did you have specific training conducted? Did you do anything, you talked about the workshops, were there any other things? Did you go online that sort of thing?

I: Training wise, no. I went online and read. You know, like you go to the DSpace website and you sort of go and see what other libraries are doing on the web, using DSpace, but you looking at it with a different view now, you looking at with a more critical view. How you can use it, how you can organize your system. Armm, but training, I would say what we had was sensitization in that we asked one of the ICT people from UWI to come and give us a presentation on it. Not the whole staff, just the main library, people who have to implement it and we also put our ICT persons on staff (as the ICT person we have now was not here then, so we used our main IT) and arm, so we put him on to this technical guy because we had to get it loaded you know and all the other stuff.

R: In terms of your end users, when the system became operational, was training conducted with them?

I: Well we not at that stage yet, So we are now at the stage, actually Monday we are suppose to have training, to sensitize the staff (Unit wise) to DSpace, to what databases we have on DSpace, to how to access it and it just so happen that this is coming at a time when we are also launching SharePoint staff page, so we doing it as a holistic sensitization going into this new law term. So we going into it with whole new sought of IT thing. However, over the last year, going back, year and a half, the same populating of the database was being done by specific persons and those persons would have been trained along the way. But they tended again to be limited in that they would have been trained in the area, on the database that they were doing.

R: Well I know you had outlined before some of things you wanted to happen, in terms of having all the material in one place. I'm regarding that as one of the benefits that you would have gotten from it?

I: That and the accessibility across the libraries is very important. Because although there are five libraries, we operate as we are one library in different rooms. It's just that you have this geographic space and you **don't want to have to be duplicating things.**

R: One of the benefits that has been identified in the literature is the ability to customize the source code. Was this done?

I: It was not done. The person in IT who did it was given an assignment, load this on and that was basically what was done. Having this ICT Officer coming on board now, assigned to the Library (it's not a position we have had before) I'm really hoping that (although his background is not so much in programming which is what you need) but at least I would have somebody a little more interested. **I know what I want customized already. I could tell you. I could tell them. I could speak to it. I know they have to go back and look for this file. I know enough to know that but we don't have the how to.**

R: In terms of maintenance, were there a time when you experienced any trouble with it?

I: I never experience any trouble with it. I think the limitations were the customization requirements from our perspective and again now because I have an IT person at least the which is another reason why I would say what it might have done is make us hesitant even coming out how we are going now, it might have delayed it a little bit because who seeing about all this if you putting extra passwords, extra this, extra that who monitoring all these things? You know, now that I have the ICT person, even if it is to do the basic training I could you know, so now we could kinda go out a little bit. But technical expertise **as far as the customization is concerned I have not found any down time for DSpace to say that we had to, that we had a problem with it.** Ah cyar really say we have had a need for it from the down time point of view.

Key:

Benefits (Actually experienced)

Factors Influencing Adoption

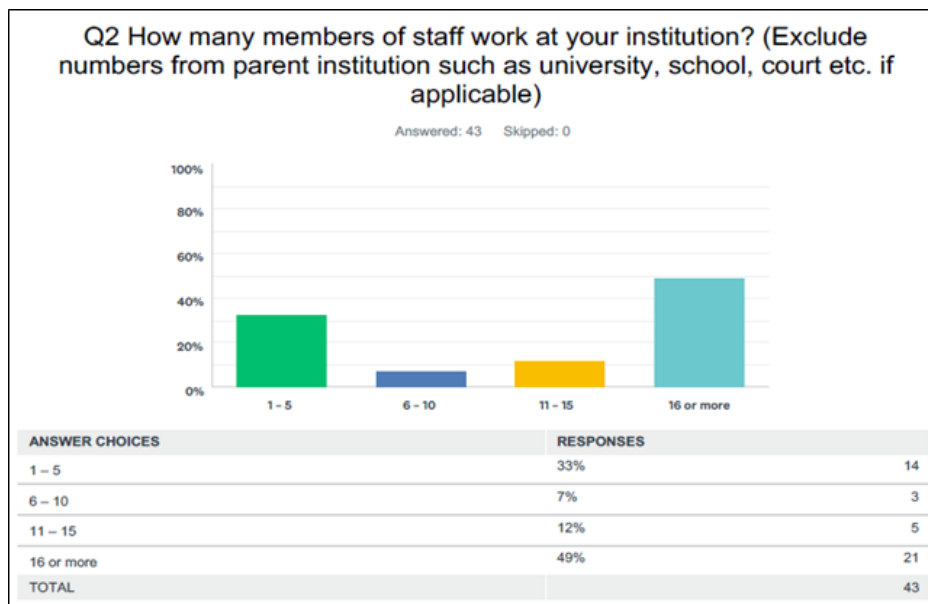
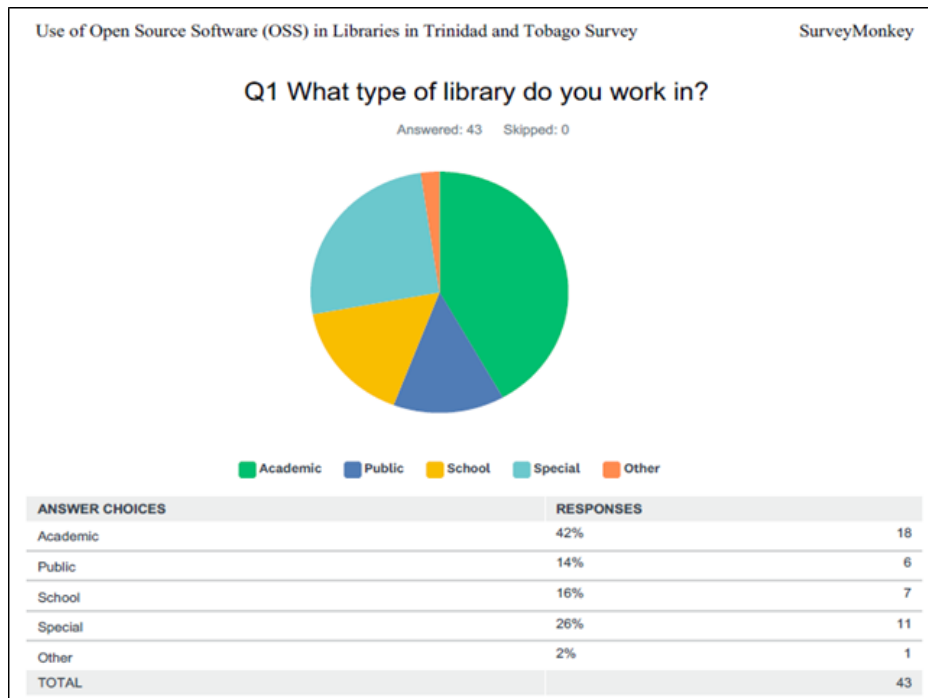
Administration (Training)

Issues (Maintenance)

Issues (Staff Expertise to Customize)

APPENDIX M: SUMMARY OF RESULTS FROM SURVEYMONKEY

(Note: Expanded and open-ended responses not included to ensure confidentiality)

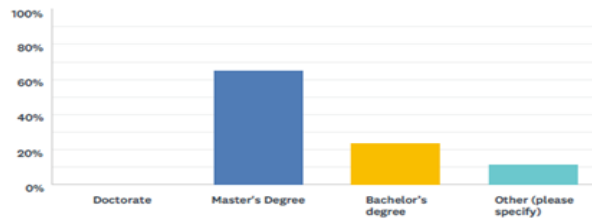


Q3 Please indicate your designation/position. (Librarian, Systems Librarian etc.)

Answered: 43 Skipped: 0

Q4 What is your highest level of professional qualification? (To help assess professional skills and competencies)

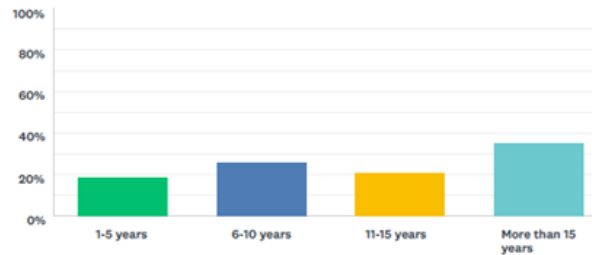
Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
Doctorate	0%	0
Master's Degree	65%	28
Bachelor's degree	23%	10
Other (please specify)	12%	5
TOTAL		43

Q5 Please indicate your years of experience as a library and information professional.

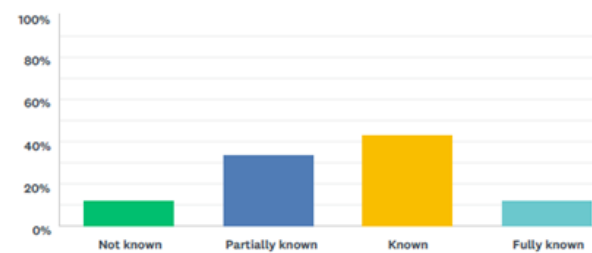
Answered: 43 Skipped: 0



ANSWER CHOICES	RESPONSES	
1-5 years	19%	8
6-10 years	26%	11
11-15 years	21%	9
More than 15 years	35%	15
TOTAL		43

Q6 Please indicate the extent of your knowledge of open source software (OSS). (Partially known means have basic information about OSS; Known means aware of OSS and its benefits but have not used any applications; Fully known means very familiar with OSS and its benefits and effectively uses specific OSS applications/solutions).

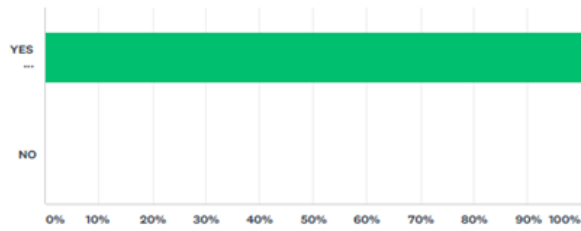
Answered: 42 Skipped: 1



ANSWER CHOICES	RESPONSES	
Not known	12%	5
Partially known	33%	14
Known	43%	18
Fully known	12%	5
TOTAL		42

Q7 If you have never heard about OSS would it be an area you would like to explore in the future?

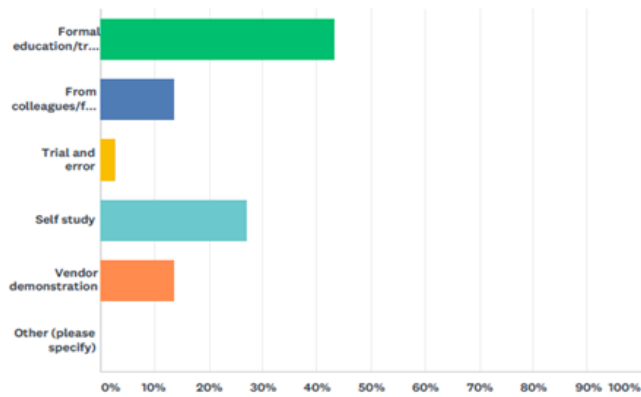
Answered: 5 Skipped: 38



ANSWER CHOICES	RESPONSES	
YES	100%	5
NO	0%	0
TOTAL		5

Q8 Based on your knowledge of OSS, how was this acquired? Please select the primary method.

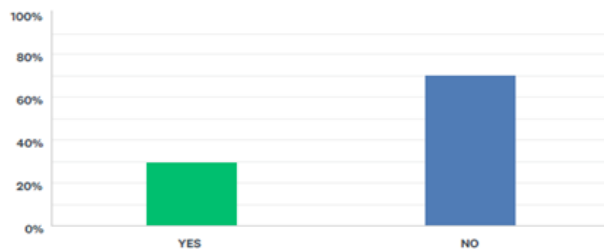
Answered: 37 Skipped: 6



ANSWER CHOICES	RESPONSES	
Formal education/training (e.g course/workshop)	43%	16
From colleagues/friends	14%	5
Trial and error	3%	1
Self study	27%	10
Vendor demonstration	14%	5
Other (please specify)	0%	0

Q9 Are you currently using any OSS solutions (eg. Koha, DSpace)?

Answered: 37 Skipped: 6



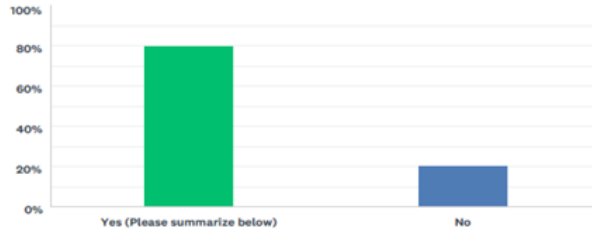
ANSWER CHOICES	RESPONSES	
YES	30%	11
NO	70%	26
TOTAL		37

Q10 Please state briefly what is being used and for what purpose.

Answered: 10 Skipped: 33

Q11 Were there any factors (such as cost and support) that influenced your decision to adopt your current OSS solution?

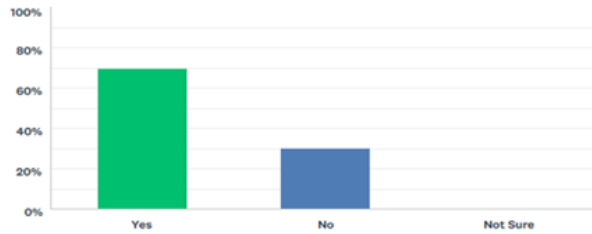
Answered: 10 Skipped: 33



ANSWER CHOICES	RESPONSES	
Yes (Please summarize below)	80%	8
No	20%	2
TOTAL		10

Q12 Was training conducted to facilitate present and long-term usage of OSS?

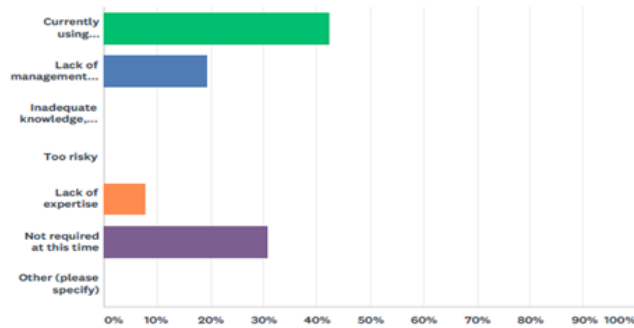
Answered: 10 Skipped: 33



ANSWER CHOICES	RESPONSES	
Yes	70%	7
No	30%	3
Not Sure	0%	0
TOTAL		10

Q13 Please select the most applicable reason for not currently using any OSS solutions.

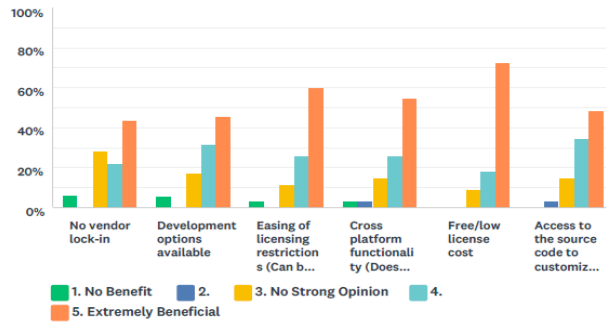
Answered: 26 Skipped: 17



ANSWER CHOICES	RESPONSES	
Currently using proprietary software	42%	11
Lack of management support	19%	5
Inadequate knowledge, documentation etc.	0%	0
Too risky	0%	0
Lack of expertise	8%	2
Not required at this time	31%	8
Other (please specify)	0%	0
TOTAL		26

Q14 Listed below are some of the most cited benefits/advantages experienced when using open source software. Please indicate how beneficial each has been or would be to your institution, on a scale of 1-5 (where 1 is of No Benefit and 5 is Extremely Beneficial). Please select ONE option for each statement.

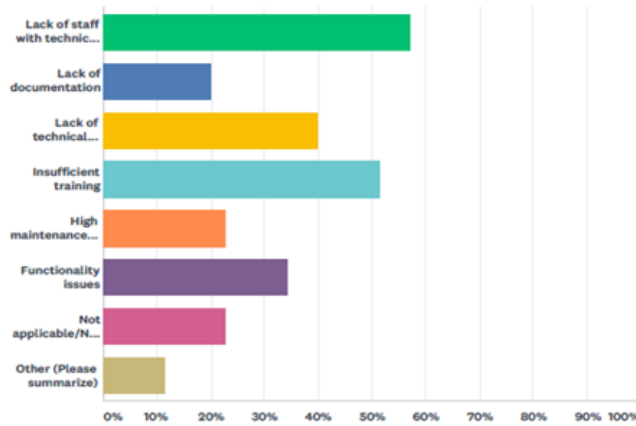
Answered: 35 Skipped: 8



	1. NO BENEFIT	2.	3. NO STRONG OPINION	4.	5. EXTREMELY BENEFICIAL	TOTAL	WEIGHTED AVERAGE
No vendor lock-in	6.25% 2	0.00% 0	28.13% 9	21.88% 7	43.75% 14	32	3.97
Development options available	5.71% 2	0.00% 0	17.14% 6	31.43% 11	45.71% 16	35	4.11
Easing of licensing restrictions (Can be used on multiple platforms without penalties)	2.86% 1	0.00% 0	11.43% 4	25.71% 9	60.00% 21	35	4.40
Cross platform functionality (Does not depend on specific hardware or operating system)	2.86% 1	2.86% 1	14.29% 5	25.71% 9	54.29% 19	35	4.26
Free/low license cost	0.00% 0	0.00% 0	9.09% 3	18.18% 6	72.73% 24	33	4.64
Access to the source code to customize the software	0.00% 0	2.86% 1	14.29% 5	34.29% 12	48.57% 17	35	4.29

Q15 Listed below are some of the most cited issues related to the adoption of open source software. Please select any you may have experienced. You can select multiple options.

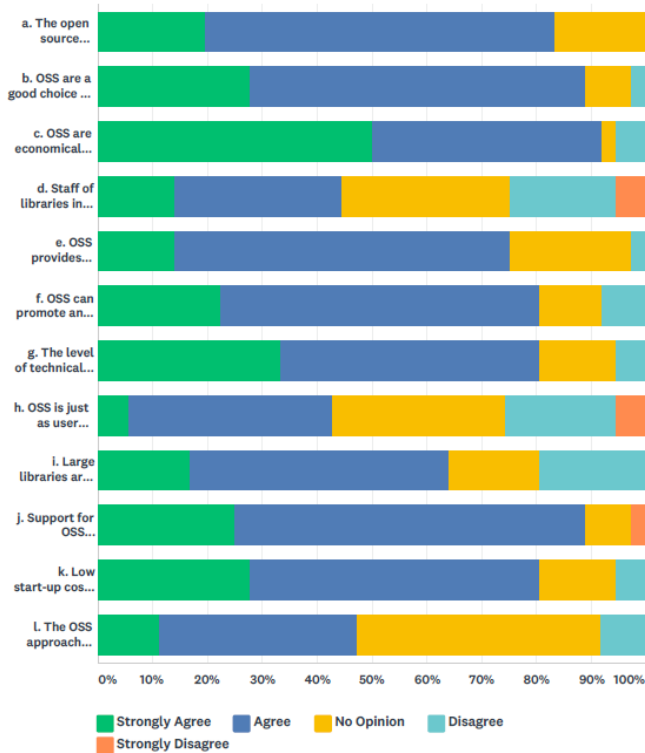
Answered: 35 Skipped: 8



ANSWER CHOICES	RESPONSES
Lack of staff with technical expertise	57% 20
Lack of documentation	20% 7
Lack of technical support from vendor (online help, user groups etc.)	40% 14
Insufficient training	51% 18
High maintenance costs	23% 8
Functionality issues	34% 12
Not applicable/No major issues	23% 8
Other (Please summarize)	11% 4
Total Respondents: 35	

Q16 Please select the option that corresponds to your level of agreement with each statement.

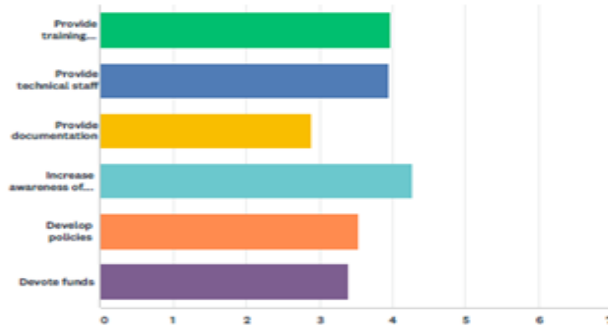
Answered: 36 Skipped: 7



	STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE	TOTAL	WEIGHTED AVERAGE
a. The open source philosophy matches with libraries' mission and objectives in a broader sense.	19% 7	64% 23	17% 6	0% 0	0% 0	36	1.97
b. OSS are a good choice for libraries to adopt.	28% 10	61% 22	8% 3	3% 1	0% 0	36	1.86
c. OSS are economical technological solutions for libraries with limited budgets.	50% 18	42% 15	3% 1	6% 2	0% 0	36	1.64
d. Staff of libraries in Trinidad and Tobago are competent enough to implement OSS.	14% 5	31% 11	31% 11	19% 7	6% 2	36	2.72
e. OSS provides flexibility to customize, according to the local needs of libraries.	14% 5	61% 22	22% 8	3% 1	0% 0	36	2.14
f. OSS can promote an increase in staff expertise through the involvement in new developments.	22% 8	58% 21	11% 4	8% 3	0% 0	36	2.06
g. The level of technical knowledge needed to install and maintain OSS can be a barrier to its use.	33% 12	47% 17	14% 5	6% 2	0% 0	36	1.92
h. OSS is just as user friendly as commercial software.	6% 2	37% 13	31% 11	20% 7	6% 2	35	2.83
i. Large libraries are more likely to have staff with necessary skills and experience to implement OSS.	17% 6	47% 17	17% 6	19% 7	0% 0	36	2.39
j. Support for OSS applications can vary and often depends on the user/developer community's commitment to the project.	25% 9	64% 23	8% 3	0% 0	3% 1	36	1.92
k. Low start-up cost associated with OSS is a main attraction to use.	28% 10	53% 19	14% 5	6% 2	0% 0	36	1.97
l. The OSS approach provides more flexibility and a better match to libraries' requirements.	11% 4	36% 13	44% 16	8% 3	0% 0	36	2.50

Q17 From the list below please rank in your view in order of priority, the actions that may be necessary to encourage the adoption of OSS in your institution (if applicable) or other institutions in Trinidad and Tobago, where 1 is the highest priority.

Answered: 40 Skipped: 3



	1	2	3	4	5	6	TOTAL	SCORE
Provide training courses	23%	20%	16%	10%	13%	13%	31	3.97
Provide technical staff	16%	20%	16%	23%	16%	3%	31	3.94
Provide documentation	0%	7%	33%	23%	13%	23%	30	2.87
Increase awareness of its importance (workshop, vendor demonstration)	41%	13%	6%	19%	16%	6%	32	4.25
Develop policies	18%	18%	15%	12%	26%	12%	34	3.53
Devote funds	23%	13%	15%	10%	10%	30%	40	3.38

Q18 Please add any further comments about OSS here:

Answered: 8 Skipped: 35