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A Proposed Study on Factors Affecting the Perceived Usefulness and Adoption of Open Source Software in the Public Sector

A Jamaican Case Study

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RESEARCH IN PROGRESS

ABSTRACT

Many developing countries currently face common problems regarding Information and Communications Technology (ICT). These problems typically include the lack of technical and know-how knowledge and the lack of appropriate technologies to meet their information processing and software needs. The situation worsens with the absence of adequate investment in technology and clear policies for technology adoption and use.

Increasing interest in end users' reactions to ICT has elevated the importance of theories that predict and explain ICT acceptance and use. This paper seeks to investigate the application of two such theories, the Technology Acceptance Model (TAM), and the Theory of Adoption and Diffusion to FOSS, to the adoption rate of FOSS in the Jamaican Public Sector.

1. INTRODUCTION

Software can be classified as either proprietary software or free and open source software (Perens, 1998). Free Open Source Software (FOSS) is emerging as a significant economic, social, and cultural phenomenon (von Hippel and von Krogh, 2003). According to a survey by Netcraft, as of August 2009, 47% of the web server market had been captured by the open-source Apache software, compared to 22% by the proprietary Microsoft web server (Netcraft, 2009). Other successful examples of open-source software include GNU/Linux, Sendmail, and the Perl programming language (von Hippel and von Krogh, 2003).

Increasing interest in end users' reactions to IT has elevated the importance of theories that predict and explain IT acceptance and use.

This paper seeks to investigate factors that affect the use and adoption rate of FOSS in the Public Sector in Jamaica. This will be done by applying two theories, the Technology Acceptance Model (TAM), and Rodger's Theory of Diffusion of Innovations (DOI).

1.1   Free and Open Source Software Evolution

During the past two decades, the software market has been dominated by Commercial Off-the-Shelf (COTS) products.

However, the intrinsic limitations of COTS software (e.g. closed source code, lock-in effect, expensive upgrades, security weaknesses etc.) have emerged over time. This led to the development of a parallel 'economy' based on FOSS. FOSS refers to programs whose source code is made available for use and modification without the expensive license fees imposed by COTS software editors. Several researches identified that the emerging of FOSS is part of the force behind increasing technology adoption in developing countries (UNCTAD 2003).

1.2.   OPEN CONCEPT

Software carries the instructions that tell a computer how to operate. The human authored and human readable form of those instructions is called *source code*. Before the computer can actually execute the instructions, the source code must be translated into a machine readable (binary) format, called the *object code*. All distributed software includes the object code, but FOSS makes the source code available as well.

Proprietary software owners license their copyrighted object code to a user, which allows the user to run the program. FOSS programs, however, license both the object and the source code, permitting the user to run, modify and possibly redistribute the programs. With access to the source code people have the freedom to run the program for any purpose, redistribute, probe, adapt, learn from, customise the software to suit their needs, and release improvements to the public for the good of the community.

1.3.   ADMINISTRATIVE USE OF FOSS

It is reasonable for government to seek full rights to order or commission development of software to their own specification rather than allow a contractor to control this area.

Where appropriate, government can choose to release the software under an open source license and hence open the contractor's work to general scrutiny. Maintenance and upgrade might then be conducted by different contractors and hence minimize supplier lock-in.

Components of these systems might include proprietary products such as Oracle which require a large investment in time and money to set up and establish. The challenge of migrating legacy systems to open source platforms can be daunting and involve risks many companies will hesitate to take without clear guidelines and support.

2.0   MOTIVATION AND RESEARCH QUESTIONS

2.1   Reports from numerous projects of international institutions suggest that FOSS has particular features that are inductive not only in cost reduction, but also in supporting sustainable development of software and capacity building.

2.2   Our hypotheses are suggesting that there are factors that affect the rate at which FOSS can be diffused throughout the Public Sector of Jamaica. While there are significant cost savings to be garnered from the use of such software, there are possible inhibiting factors which could stymie this advantage. In order to maximize the full achievement of these cost saving benefits, strategic information is needed for the different stakeholders to craft policies and plan effectively.

2.3   This research will seek to provide such information, enabling the various stakeholders to direct their activities for optimal effectiveness. In this study we will gather information on the extent of knowledge, awareness and usage of FOSS in the Jamaican Public Sector. This information will be disseminated to the stakeholders, specifically to ICT policy makers and educational institutions, ICT system managers/analysts and current and potential users.

2.4   The research questions are:

How is FOSS adoption rate affected by:

1. The extent to which FOSS is perceived as being useful in the Public Sector?

2. The extent to which FOSS useful in the public sector?

3.   STATEMENT OF THE PROBLEM

Using innovation diffusion theory and knowledge-based trust literature, this study seeks to develop a research model to examine the effect of innovation attributes (perceived relative advantage, ease of use and compatibility) and knowledge-based trust (perceived competence, benevolence and integrity) on attitude and behavioural intention about adopting FOSS across the public sector in Jamaica.

Most of the previous studies on FOSS look at its opportunities for reducing organizational costs and do not consider such software's capacity to fully meet the needs of today's organizations (Gacek and Arief 2004; Bergquist and Ljungberg 2001).

This model will look at the specific context of the public sector of a small developing country namely Jamaica.

3.1   Definition of Terms, Keywords

- **IT governance** can be viewed as how IT creates value that fits into the overall Corporate Governance Strategy of an organisation (ITGI, 2010)

- **FOSS** programs are programs whose licenses permit users the freedom to run the program for any purpose, to study and modify the program, and to freely redistribute copies of the original or modified program. In general term, FOSS is software that is built and enhanced through public collaboration. It is free and it gives the user unrestricted access to the source code (Open Source Initiatives, 2005).

- **Software Diffusion** is the process by which a new software product is accepted by the market. The **rate of diffusion** is the speed at which the new software spreads from one entity to the next (Rodgers, 1995).

- **Software Adoption** is similar to diffusion except that it deals with the psychological processes an individual goes through, rather than an aggregate market process (Rodgers, 1995).

- **The Information and Communication Technology (ICT) Strategy** defines the technical direction and framework for Government-wide technology based developments, services and risk management.

- **Diffusion** is the "process by which an innovation is communicated through certain channels over a period of time among the members of a social system. An innovation is "an idea, practice, or object that is perceived to be new by an individual or other unit of adoption" (Rogers, 1995).

4.   **THEORETICAL FRAMEWORK**

This study focuses on perceived innovation attributes and knowledge-based trust as explanatory and predictive variables for attitude and behavioural intention about adopting/using FOSS. All variables hypothesized in this study and natures of their expected relationships with customer attitude toward adopting (or continuing to use) FOSS are discussed next.

By adopting FOSS, users have the freedom of direct contribution to its development which mainly different from the typical proprietary software and other technology. Based on previous literature, technology maturity, cost, government and organization support are some of the criteria that may influence the adoption and continuous use of the FOSS. It should be noted that dependency on proprietary technology, lack of commitment and poor usability may become some of the attributes which influence the misappropriation of the technology (Golden 2004; Dedrick and West 2004; Carroll 2004; Goode 2005; Payne 2002). However, these appropriation and misappropriation criteria have not been tested empirically and may differ in the context.

It has been noted that there is a positive correlation between the growth of a FOSS developer base and the innovative software capacities of an economy. A report from the International Institute of Infonomics (June, 2002) listed three reasons for this.

i.   **Low barriers to entry**: FOSS, which encourages free modification and redistribution, is easy to obtain and use. Proprietary software tends to be much more restrictive, not just in the limited availability of source code but also because of licensing, patent and copyright limitations. FOSS allows developers to build on existing knowledge and pre-built components, much like basic research. On the other hand, existing proprietary software is often the result of years of building and refinement that a software company in a developing country has little chance of developing a competitive system and selling it.

ii. **FOSS as an excellent training system**: The open and collaborative nature of FOSS allows a student or software engineer to examine and experiment with software concepts at virtually no direct cost to society. Apart from the source code and software tools that FOSS provides, there are many technical manuals, guides and 'how-tos' provided in every FOSS distribution.This documentation is the equivalent of thousands of dollars of manuals and textbooks, all available and freely redistributable. A student can also tap into the global collaborative FOSS development network that includes massive archives of technical information and interactive discussion tools. Proprietary systems are usually closed and do not encourage this experimentation and learning.

iii. **FOSS as a source of standards:** FOSS often becomes a de facto standard by virtue of its dominance in a particular sector of an industry. By being involved in setting the

standards in a particular FOSS application, a region can ensure that the standard produced takes into account regional needs and cultural considerations. For instance, proper word wrapping is still an issue with many non-roman alphabetical languages and holds back the development of word processors, browsers, databases and other software tools for these languages. However, the Chinese language, although based on a radically different system from that of western languages, is decently supported in FOSS systems due to the involvement of Chinese-speaking FOSS developers.

Although the low price of FOSS products is the primary factor for using these products, there are also economic perspectives, not only in using FOSS but also in developing products. (Dravis, 2003) has identified four economic incentives for the adoption of FOSS software and support its development by governments. They are

    i.   Control the costs of software licensing and upgrades

    ii.   Control and increase the access to intellectual properties

    iii.   Reduce the reliance on proprietary software

    iv.   Promote software use in the public sectors

4.1   Technology Transfer

A substantial portion of technology transfer occurs outside the technology transfer market itself. That is technical knowledge spreads internationally by non-commercial means, and it may even be transmitted free of charge. (UNIDO, 1996)

Technology transfer refers not only to the movement of technology from the owner or producer to the receptor, but also refers to the diffusion of technology and knowledge through human activities (Zhao et al., 1992). Rogers (2003) has argued that technology transfer is not a one-way information flow, but a two-way communication process, based on information exchange between the producers and the receptors.

The recognition of a fundamental shift in the business and economic environment is not just a recent phenomenon, and can be traced back a few decades, to the work of (Machlup, 1962) and (Bell, 1974). Current writings on the emergence of a "Digital Economy", the "Information Age" and the "Knowledge Economy", though generally associated with the

impact of the new information and communications technologies, have their genesis in the rise in importance of 'information' and 'knowledge' as the drivers of the transformation of the western industrialised societies to more 'services based economies' (Masuda, 1983).

5.   Literature Review

Research on FOSS success factors has been gaining popularity although the literature is still somewhat limited. Elements typically cited as significant for FOSS project success include the devotion of developers and market structure (Bonaccorsi and Rossi, 2003), a critical mass of developers (Mockus et al., 2002), software quality and community service quality (Lee et al., 2009), license strategy and organizational sponsorship (Stewart et al., 2006), developer and user interest (Subramaniam et al., 2009), collective identity and trust (Stewart and Gosain, 2006).

Democratic governments around the world increasingly are realizing that with respect to management and processing of information they are in a position quite different from private sector companies.

Some of these differences are (Nunez and Ackerman, 2002):

1.   The government's clients are all the natural and legal persons of the country.
2.   The information is public, i.e. these persons at the same time are the owners of the information kept and processed by government.
3.   Government must therefore guarantee free (open, non-discriminatory) access to this public information.
4.   It must guarantee permanence of public data.
5.   It must guard against misuse of the data in a way that might undermine national security as well as the security of its citizens.

The use of FOSS has become an international phenomenon, moving from relative obscurity to being the latest buzzword (Wong et al., 2004). The term, FOSS refers to software that is available without cost on the Internet and is developed in voluntarily basis. In order for software to be considered as FOSS, it must comply with the following conditions according to the Open Source Initiative OSI (Perens, 2006) and the Free Software Foundation (FSF):

• The source code must be freely available

• Free to use for any purpose

• Free to modify and to customize

• Free to redistribute

• Free to create derivative work

• Free to join the development and cooperation

FOSS products are characterised by their low cost, voluntary work, and continuous testing by many participants including users. In addition, the developers participate according to their own free will, which increases the productivity and quality (Potdar et al., 2004).

(Dravis, 2003) has identified four economic incentives for the adoption of FOSS software and support its development by governments:

• Control the costs of software licensing and upgrades

• Control and increase the access to intellectual properties

• Reduce the reliance on proprietary software

• Promote software use in the public sectors

 (Potdar et al., 2004) states that FOSS is considered as a public good (created and used by the public). Indeed, FOSS achieved its goals in the software field in 2005, and is becoming more appropriate for other fields (Raymond, 2001).

The literature has recurrently documented the importance of user participation in software development (Ives and Olson, 1984). As the FOSS development model does not involve formal protocols for the collection of user requirements, user involvement enhances a FOSS project's ability to acquire user knowledge and requirements, leading to greater technical improvements. User/developer participation helps the project foster user ownership and loyalty, leading to greater acceptance of the software (Bhattacherjee, 1998). Researchers have suggested that devotion and support from both developers and users are critical for the success of Apache and Mozilla (Mockus et al., 2002). User orientation captures the speed at which the project team resolves bugs, adds features, and meets user requirements. Greater user orientation leads to faster technical improvement and greater user satisfaction, which in turn improves user acceptance of the software. Researchers have suggested that concerns

over reliable ongoing software updates and technical support are a major barrier to FOSS adoption (Goode, 2005). Greater user orientation could help mitigate such concerns, leading to a greater adoption rate. In some respects, user/developer participation and user orientation are indicators of FOSS projects' dynamic capability since they reflect a FOSS project's ability to gain and mobilize resources (developers/users) to adapt to the constantly changing user needs and technological environment, and hence should be important sources of FOSS project success (Teece et al., 1997).

During the past eighteen years, the information systems community considered TAM a parsimonious and powerful theory (Lucas and Spitler, 1999; Venkatesh and Davis, 2000). TAM has been applied to different technologies (e.g. word processors, e-mail, WWW, Hospital Information Systems) under different situations (e.g., time and culture) with different control factors (e.g., gender, organizational type and size) and different subjects (e.g. undergraduate students, MBAs, and knowledge workers), leading its proponents to believe in its robustness.

A number of theories that have been applied to the causal linkage of a user's Information Systems acceptance behaviour may be aligned with TAM research.

Social Cognitive Theory (Miller and Dollard, 1941), Diffusion of Innovation Theory (Rogers, 1962), the Theory of Planned Behaviour/Reasoned Action (Ajzen and Fishbein, 1980), the Technology Transition Model (Briggs et al., 1999), and Social Network Theory (Robertson, 1989) are representative examples.

Integration efforts are required to obtain a better understanding of IT adoption (Hu et al., 1999). Examples of such efforts include TAM II (Venkatesh and Davis, 2000) and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003).

Rogers (2003, pp21) in his well known Diffusion of Innovation (DOI) theory defined a*doption* as "a decision to make full use of an innovation as the best course of action available." This DOI theory has been widely applied in studying technology in organizational contexts. There are criticisms on the relevancy of Rogers' theory on technology use and its explanatory power in organizational settings (Carroll 2004). There is a limitation of the application of this theory on IS field as it focus on general adoption of new techniques, engineering, macro as well as micro issues, rather than strictly IS. There were only small sections of the theory that highlight technology rejection including *active rejection*, *passive*

rejection and *discontinuance* (Rogers 2003, pp178) but there is no further analysis on these issues, whereas technology rejection is common in organizations (Abrahamson 1991).

The scope of the theory is also narrow and does not consider the richness of human behaviours and many other factors which influence the decision-making process such as trend, peer adoption, critical mass and other complex factors (Abrahamson 1991; Larsen 2001), and in particular in a business setting.

Rogers (1986), considered by many the "guru" of adoption/diffusion revealed three important ways in which the adoption of any interactive communications differs from that of previous innovations. These are:

1. A critical mass of adopters is needed to convince the "mainstream" users of the technology's efficacy.

2. Regular and frequent use is necessary to ensure success of the diffusion effort.

3. Technology is a tool that can be applied in different ways and for different purposes and is part of a dynamic process that may involve change, modification and reinvention by individual adopters.

Diffusion research has focused on five elements: (1) the characteristics of an innovation which may influence its adoption; (2) the decision-making process that occurs when individuals consider adopting a new idea, product or practice; (3) the characteristics of individuals that make them likely to adopt an innovation; (4) the consequences for individuals and society of adopting an innovation; and (5) communication channels used in the adoption process.

According to Rodgers (1986), the traditional adoption/diffusion continuum recognizes five categories of participants:

1. innovators who tend to be experimentalists and "techies" interested in technology itself;

2. early adopters who may be technically sophisticated and interested in technology for solving professional and academic problems;

3. early majority who are pragmatists and constitute the first part of the mainstream;

4. late majority who are less comfortable with technology and are the skeptical second half of the mainstream;

5. laggards who may never adopt technology and may be antagonistic and critical of its use by others. The distribution of these groups within an adopter population typically follows the familiar bell-shaped curve.

Moore (1991) sees these groups as significantly different "markets" in the "selling" of an innovation to potential adopters. He suggests that the transition from the early adopters to the early majority--one that is essential to an innovation's success--offers particular potential for breakdown because the differences between the two groups are so striking (See table 1).

Early Adopters	Early Majority
• Technology focused • Proponents of revolutionary change • Visionary users • Project oriented • Willing to take risks • Willing to experiment • Individually self-sufficient • Tend to communicate horizontally (focused across disciplines)	• Not technically focused • Proponents of evolutionary change • Pragmatic users • Process oriented • Averse to taking risks • Look for proven applications • May require support • Tend to communicate vertically (focused within a discipline)

Table 1 (adapted from Geoghegan, 1994).
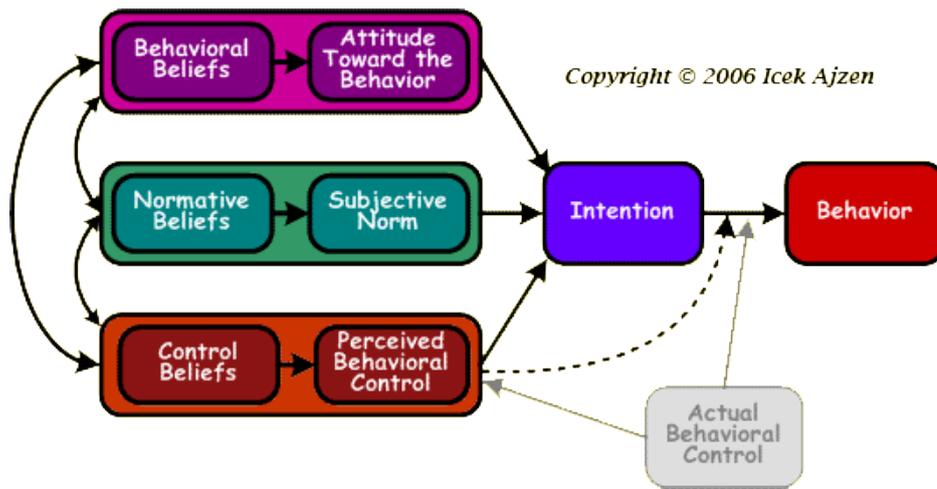
Theory of Planned Behaviour

Figure 1

The Theory of Reasoned Action (TRA) was developed by Fishbein and Ajzen (1967, 1975, 1980). Originally developed in 1967; this theory was further developed during the 1970's. By the 1980's, it was very commonly used to study human behavior. The theory originated in the field of social psychology. Fishbein and Ajzen were both working on similar concepts to explain human behavior, and eventually collaborated to create and publish the model in 1980.

Expectancy-Value Theory (EVT)

Martin Fishbein is credited with developing the expectancy-value theory (EVT) in the early to mid-1970s. Expectancy-value theory was originally created in order to explain and predict individual's attitudes towards objects and actions.

Technology Acceptance Model

The Technology Acceptance Model (TAM) represents an important theoretical contribution toward understanding IS usage and IS acceptance behaviours (Davis, 1989)

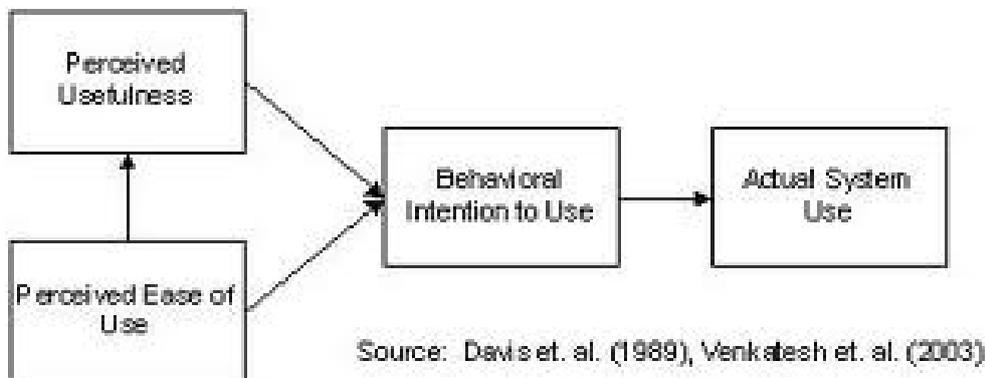Source: Davis et. al. (1989), Venkatesh et. al. (2003)

Figure 2

The Technology Acceptance Model (TAM) is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it, notably:

Perceived usefulness (PU) - This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance".

Perceived ease-of-use (PEOU) - Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989).

The TAM has been continuously studied and expanded-the three major upgrades being the TAM 2 (Venkatesh & Davis 2000 & Venkatesh 2000) and the Unified Theory of Acceptance and Use of Technology (or UTAUT, Venkatesh et al. 2003) and TAM 3 (Venkatesh & Bala 2008).

4.3   Technology in Organization

Technology-organization-environment (TOE) model by DePietro et al. (1990) are frequently used to look at technology adoption at organizational level. The TOE is an influential framework for understanding IT adoption in an organizational context, which consists of three elements technology that relates to the competency of the technology to the organization, organization which measures firm size and scope, the centralization, formalization, quality of human resources and organizational slack (Xu et al 2004; Dedrick and West 2004) and environment that described the external relationships of the organization, which include its industry, competition, relations with buyers and suppliers, external skills such as auditors and consultants as well as deals with government (DePietro et al. 1990; Dedrick and West 2004).

The model has been used in an exploratory study of open source platform adoption (Dedrick and West 2004), e-commerce use (Gibbs and Kraemer 2004) Internet adoption and many other empirical studies (Xu et al. 2004).

5.   METHODLOGY

Based on the DeLone and McLean (2003) model of information systems success, Crowston et al. (2003) identify a range of measures applicable for assessing the success of FOSS projects.

Some of these measures have been widely used in the literature, including process-level measures (e.g., level of activities, number of developers, and team effectiveness) and project- level measures (e.g., adoption rate, user satisfaction, user net benefit, and technical success). Focusing on project-level outcome, this study examines both adoption rate and technical success as they have a slightly different orientation (market- and technical-oriented). Adoption rate refers to the market popularity of a FOSS product and technical success refers to the level of technical and functionality improvements a FOSS project has accomplished (Grewal et al., 2006) . Inclusion of these criteria is consistent with the literature on FOSS project success (Grewal et al.,

2006; Singh, 2007). The user-reported success measures such as user satisfaction and net benefits are not considered here because it is difficult to select a true random sample of FOSS users as this population is generally unknown (Crowston et al., 2003).

A quantitative research technique will be utilized to obtain insight into the current situation of FOSS use in the public sector. As our main method of data collection, a total of 500 structured questionnaires will be administered in different public sector entities across the Government of Jamaica.

A Multiple Linear Regression Technique will be used to analyse the data. This will be tested at a 95% confidence interval.

A sample size of 1500 public sector employees will be used representing a large sample. This we believe is representative of the Public Sector Workers in Jamaica. The sample will be drawn from selected public sector entities across the country. The types of Public Sector Entities are Ministries, Departments of Government and Government Agencies. A stratified random sample will be done to ensure a representative sample of the population.

Questionnaires will be emailed to persons who were really interested to participate with an anticipated response rate of between 85 – 100 percent.
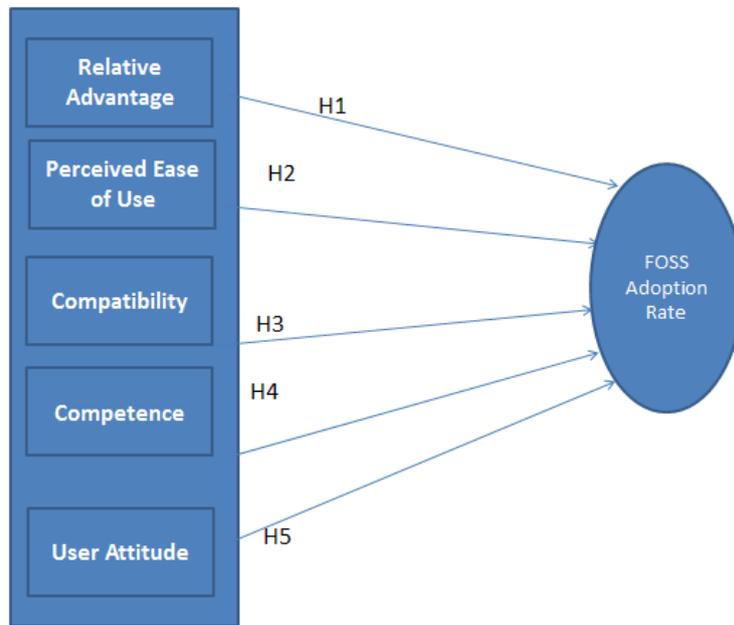
The Proposed Model

Figure 3

Hypotheses

H1. Perceived relative advantage has a positive effect on attitude toward adopting FOSS

H2. Perceived ease of use has a positive effect on attitude toward adopting FOSS

H3. Perceived compatibility has a positive effect on attitude toward adopting FOSS

 H4. Perceived competence has a positive effect on attitude toward adopting (or continuing to use) FOSS.

H5. User attitude has a positive effect on behavioural intention about adopting (or continuing to use) FOSS.

The MODEL

$$\alpha = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Where

α is the dependent variable (adoption rate)

β_1, β_2, β_3, β_4, β_5 are the independent variable coefficients

X_1, X_2, X_3, X_4, X_5 are the independent variables (Relative Advantage, Perceived ease-of-use, Perceived Compatibility, Competence, Perceived usefulness, User Attitude)

and ε is the error term

The research hypotheses will be evaluated by analyzing data drawn a cross-section of Public Sector MIS Officer and End Users.

The independent variables will be mean-centered to minimize the incidences of distortion due to high multicollinearity.

This study's main sample will be drawn from one population-the Public Sector of Jamaica. The Unit of Analysis will be Public Sector Entities (Ministries, Departments and Agencies). The unit of observation will be Public Sector MIS Technocrats, ICT Officers and end users.

This study will investigate a contemporary phenomenon within its real-life context. Clearly, the case study research method is particularly well suited to this research, since the object of the study here is of information systems in organizations, and the interest is more on the organizational aspect rather than the technical issues (Yin 1994).

Since organizations' FOSS appropriation has rarely been analyzed previously in the literature, multiple case studies with triangulations of methods and views (Yin 1994) are useful to understand the process, context, and specific phenomena in this issue. The research intent to build upon a multiple case study based on a snapshot view to find out how FOSS can be appropriated in several public sector bodies in Jamaica.

The organizations will be chosen based on their similarities and differences (Orlikowski 1993), which may affect the study in various ways and be the base of the comparison between the organizations. Organizations variables will be identified based on the type of operation, location, size structure and culture. Initial set of exploratory questionnaires will

then be sent to the identified organizations to get the overview of their FOSS implementation status and the feedback on their cooperation for later case studies. The case studies will only then be conducted to organizations, which are considered relevant and willing to provide access. This is important as the gatekeeper or someone who provides access to the organizations may influence or shape the direction of the research (Neuman 2003). Variety of quantitative and qualitative research methods suitable for case study research (questionnaires, observation, interviews and document analysis) will then be used in order to gather data. This triangulation method will enable a more comprehensive data to be gathered (Neuman 2003; Yin 2004)

The main data gathering instrument will be Questionnaires (Structured). Data for this study will be collected by the means of a survey conducted across Government entities. The questionnaires will be distributed to a total of 500 participants.

The Independent Variables will be:

- Relative Advantage

- Perceived ease of use

- Perceived Compatibility

- Competence

- User attitude

The Dependent Variable will be Adoption Rate of FOSS

The adoption rate is a measure of the success of the implementation of FOSS in the Public Sector in Jamaica. As influenced by the variables below.

The Model defines the independent variables that are expected to influence the dependent variable as follows:

Table 2

Variable	Definition
Relative Advantage	How improved is FOSS over Proprietary Software
Perceived ease-of-	Davis defined this as "the degree to which a person believes that using a

use	particular system would be free from effort" (Davis 1989).
Perceived Compatibility	The level of compatibility that exist between FOSS and other Software (Legacy and otherwise).
Competence	The extent to which the user possesses the competence to use the software
Perceived usefulness (PU)	- This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance".
User Attitude	How easily an innovation may be experimented. If a user is able to test an innovation, the individual will be more likely to adopt it.

Operationalization

1. We will use questionnaires to collect information on knowledge and awareness of FOSS. There is a whole range of knowledge categories, which need to be comprehensively evaluated in the survey. Sometimes people may be using FOSS without realizing it. Apart from knowledge, there is also the question of people's awareness of the significance, benefits etc. of FOSS. Therefore, the survey will seek to address questions such as these:

    a. Are people in the public sector aware of FOSS?

       Measure: Respondents will need to state whether they had heard of FOSS before or not (awareness).

    b. Do they understand the principles of FOSS and proprietary software?

    c. Are they able to apply their knowledge to classify popular packages as either FOSS or proprietary software?

    d. What are the sources of knowledge?

    e. What is the quality of the sources?

    f. What are the reasons for lack of knowledge?

2. We will seek to collect thorough information on the current usage of FOSS in the public sector such as :

   a. What is the extent of FOSS usage?

      Measure: The number of respondents who indicate that they are currently using FOSS.

   b. Which entities do these individuals belong to?

      Measure: We will use the answers to this question to indicate the groups within the Public Sector who use FOSS.

   c. How and for what purpose is it used?

      Measure: We use the answers to question to indicate the areas within the Public Sector in which FOSS is used.

   d. Why do they use or not use it?

6.   SCOPE AND LIMITATIONS

The study will be limited to Public Sector Entities. Some limitations will be willingness of subjects to participate and integrity of the responses.

7.   PRACTICAL IMPLICATIONS

Technology and its new dimensions create new challenges for information systems use throughout Governments in developing countries. Firms and Governments alike require frameworks, policies and tools that can help them to reduce the cost of software through the use of FOSS.

8.   CONCLUSION

The rich variety of collaborative processes which have evolved to create open standards, open content and open source software are establishing new paradigms for all aspects of social development and economic growth.

Currently, the FOSS concept has penetrated countries such as India and Brazil, who are considered pioneers among the developing countries that have included FOSS in their ICT policies, and established programs to support its use and development.

More countries should start contemplating the promotion of FOSS via legislative, policy or government procurement methods. If FOSS were just another method of developing software, governments would have little reason to specifically advocate FOSS. However, FOSS can bring many compelling benefits to a nation, especially a developing nation with limited resources.

Governments, at the very least, should be objectively considering the benefits they would experience and extend to society if they were to migrate to FOSS.

To conclude, in the interest of sustainable, long–term and widespread economic growth and ICT development, developing countries need to seriously consider the adoption and promote open source software in order to develop local skills and businesses, actively participate in the global ICT economy, and avoid unnecessary expenditure.

Governments must define policies and plans to support the introduction of FOSS concepts to both the universities/research institutes and the industry. They can sponsor the use and development of FOSS products and show their advantages.

Within the FOSS community, plans can be derived by the developers themselves without political or external intervention or support. Governments have only to define policies and plans to support the introduction of FOSS concepts to the academic and research institutes and the industry to sponsor the use and development of FOSS products and show their advantages. This study will definitely help to prove or disprove this claim.

Although FOSS is not a panacea, it does offer concrete opportunities for cost saving, technology insertion and flexibility. The migration and adoption process is a complex, multidisciplinary effort that touches different areas and require a complete understanding of how individual workflows are composed and executed and how people interacts with IT systems in their daily work. In this sense, a FOSS migration is a major endeavor, and as most complex efforts can easily go wrong. There are several hurdles in the execution of a migration, and some of those hurdles can be avoided easily by using simple practices. Most of the difficulties are not really technical in nature, but organizational, and will require most

effort from the upper management; another important aspect is the social impact of the migration (like user acceptance), that may require special attention.

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