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Factors That Influence the Use of Free and Open Source Software (Foss): A View among SMEs in Northern Region of Malaysia

[1]Chew Kah Mun, [2] Md. Aminul Islam, [3] R. Balishah Ahmad, [4]Shawn Laeu Wei Zhong

[1]School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis
[2]School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis
[3]School of Computer and Communication Engineering, Universiti Malaysia Perlis
[4]School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis

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ABSTRACT

The study attempted to find out factors that influence the use of Free and Open Source Software (FOSS) among Small and Medium Enterprises (SMEs) in Northern Region of Malaysia. The factors were namely reviewed as demographics characteristics, SMEs characteristics, knowledge and awareness of FOSS, perception of software, perception of FOSS and criteria of FOSS. The research instrument used in this study was a close-ended questionnaire whereby a total of 100 sets of questionnaires were distributed randomly among the SMEs in Northern Region of Malaysia. Results showed that majority sector in the SMEs were services industries (44%); majority of 70% of the SMEs do not aware of FOSS. However, the SMEs agree that Cost Saver, the 4 essential Freedoms, reliability, performance, security protection, legal and ethical judgment as the considerations that influencing them to use FOSS.

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INTRODUCTION

Information and communication Technologies (ICTs) are transforming dramatically many aspects of economic and social life, the importance of training and education, and the way people communicate with each other. However, companies, households and individuals are taking up the opportunities offered by ICT in different purposes.

Business Software Alliance announced that computer industry rebounded from the recent recession in 2010, business and consumers bought nearly $95 billion worth of PC software. However, the illegally installed worth another $59 billion, this means that every dollar spent on legitimate software, an additional 63 cents worth for unlicensed software. Moreover, of the 1.4 billion PCs now installed worldwide, nearly 50 per cent sit in the emerging markets with high piracy rates due to high-piracy markets account for a rapidly increasing share of the world's PC users. They are driving up the global piracy rate even as they marginally improve their own rates. Furthermore, the most common way people in developing software piracy is to buy a single, legal copy of a program and then install it on multiple computers which including in enterprises, where software has the greatest value. The mistaken belief is significantly happened in SMEs of Malaysia, as the 78 per cent of computer users admitted that they have acquired pirated software and the commercial value of pirated PC software was US$606 million or approximately RM1.9 billion in 2010 while the piracy rate was 56 per cent which was eventually declined 2 per cent (58 per cent in 2009). Some of the users said they pirate "all" or "most of the time", while other said "occasionally" or "rarely". This eventually means that 11 out of 20 programmes that users installed were unlicensed (Eighth Annual BSA Global Software Piracy Study, 2010).

Furthermore, the Domestic Trade, Cooperatives and Consumerism Ministry mounted 61 enforcement raids and seized 194 computer and peripherals in 2011, the result showed that 1,416 copies of suspected pirated software, with combined total estimated value of RM8.2 million. This is described that piracy software is harmful to SMEs that involve in software industry of Malaysia and should be highlighted and addressed even though their intention is to reduce investment and cost in software. Therefore, Free and Open Source Software (FOSS) presents the potential and revolution to enhance the impact of piracy software in the software industry, economic, households and individuals [9]. Free Software Foundation (FSF) defined FOSS as free access to the

Corresponding Author: Chew Kah Mun, School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis
E-mail: chewcarmenmail@gmail.com

use of software as well as the opportunities and freedom to study, modify, extend, and distribute the source code.

FOSS is made available along the source code as a distinctive feature at no cost to the users. It is liberally licensed to grant any users the freedom to run the programme in anywhere for any purpose and last forever; freedom to study how it works and to adapt and succeed to the source code; freedom to redistribute copies; and freedom to improve the programmes and even release the improvement copies to the public [20]. FOSS is described as an acronym for Free and Open Source Software. Nevertheless, the fundamental philosophical is significantly different between the free software movement and the open source software movement, free software is used entirely by the Free Software Foundation while Open Source Software by Open Source Initiative. However, Open Source Software do not just mean access to code, and license is needed in technology-neutral mode.

Consequently, Richard Stallman, the founder of FOSS considered that proprietary software limited the number of people use the programmes, limited the rights of users, harmed to the society benefit, obstructed users' adoption throughout ICT, defenced the users' requirements, and encumbered other developers to learn from the programmes or innovation. However, FSF is against pirated software that is unethical and immoral as well. FOSS is eventually encouraged to use in enterprise to reduce software licenses costs, decline the piracy rates, and give opportunity in freedom to modify in accordance with their requirements.

It is undeniable that FOSS has some advantages over proprietary and pirated software. Thus, the factors influencing the use of FOSS among Small and Medium Enterprise (SMEs) in Northern Region of Malaysia will be explored in this research.

2.0 Literature Review:

2.1 Free and Open Source Software (FOSS):

Richard Stallman defined FOSS as free software with freedom and Free Software Foundation (FSF) defined FOSS as free access to the use of software as well as the opportunities and freedom to study, modify, extend, and distribute the source code. FOSS is made available along the source code as a distinctive feature at no cost to the users. It is liberally licensed to grant any users the freedom to run the programme in anywhere for any purpose and last forever; freedom to study how it works and to adapt and succeed to the source code; freedom to redistribute copies; and freedom to improve the programmes and even release the improvement copies to the public [20].

FOSS was founded in the early 1970s by Richard Stallman and emerged into the mainstreams of United States' economy and academia in the 1990s. Foss continues to be widely used with increasing momentum in the 2000s. Gallego *et al* indicate that FOSS has introduced surprising changes in the software industry thereby radically changing perspectives in the development, use and distribution of software; and prospect to fully utilize in the 2000s.

The reason of emergence FOSS is caused whereby IBM announced to sell part of its software separately in 1970 while computer and software are came added as long as the maintenance contract was paid during the 1960s. In the mid-1970s, proprietary software is common in the field of IT. There were enormous cultural changes among the professionals who worked with software and were the beginning of a flourishing of a large number of companies dedicated to this new business that selling proprietary software [14].

While in the 1970s and early 1980s, the exploration of proprietary software model was overwhelming, Richard Stallman responded to the situation and considered that proprietary software immoral and contravenes programmers get wealth; and he truly felt that software must allow every user the right to study and modify. Thus, he started to think of how hacker's software could remain free software and started to develop an entire system. So, he left the formal job in MIT Artificial Intelligence Lab and built a complete software system for general use but totally free called as The GNU Project which caused a revolution in software world.

2.1.1 Benefit of FOSS:

FOSS provides the rights to all the users in four essential freedoms. The users have the freedom and rights to run the programmes for any purpose, anytime, and anywhere. The FOSS programmes can be installed through online by any kind of people or organisation. Besides that, the users have the freedom and rights to distribute and share the programmes to other anytime and anywhere in any method. Moreover, the source code is accessible to users, so the users have the freedom and right to study and modify the source code as their needs. The last but least freedom is the modified programmes can be redistributed to others. The users is legally downloading and sharing to others. As Richard Stallman founded FOSS as ICT tool that provide the best to society benefit.

Another benefit of FOSS is the cost saving. FOSS can lower the barriers to the access of ICTs by saving both license and development cost. Indeed, FOSS are usually not sold and with no licensing fees, only downloading, distributing and duplicating costs are borne by the users. Although the pirated softwares is easy to get in any computer store and do not charge any licensing fees as well but the initial cost of disk and service fees

are acquired, normally the pirated softwares are sold in a range of price between RM5 to RM 12 each disk. Hence, the cost of FOSS is much lower than that because excluded the initial cost for cd. Moreover, pirated softwares are illegally download due to against the copyright and intellectual property right of proprietary softwares. Nevertheless, the upgrades of FOSS can usually obtain without any cost. In contrast, proprietary software upgrades normally need to pay or even pay higher than first purchasing (W.T. Tan, 2004). Furthermore, it can save time for the component updates and corrections because more free labour is available to localize and correct the defects.

However, lower cost is not the only reason why the use of FOSS for servers is prevalent. FOSS is developed by various developers, the community of experienced developers work together to constantly remove bugs and preventing of virus, enhance the functionality and improve the source code. Ajila and Wu indicated certain opinions that the quality and transparency of FOSS may be higher than proprietary software due to peer-review that various developers had run and improved the source code. While the source code of proprietary software is closely related to the copyrights and intellectual property rights, the improvement is only modified by the companies; the users do not have the right to access the source code. Besides that, proprietary software conducted bugs and virus for illegal downloading purpose such as hackers and pirate software to protect their privileged products. Hence, FOSS is significantly focused on reliability, performance, maintainability and security protection.

Furthermore, FOSS is able to increase the moral and ethical decision. Lending, D. *et al* indicated the significant relationship between illegal behaviour and individuals' sensitivity and understanding of ethical concerns as well as their level of moral judgment based on Theory of Reasoned Action (TRA) model. Loch and Conger (1996) developed a modified Theory of Reasoned Action to investigate software piracy from the standpoint of the ethical decision making process [15].The studies showed that the low moral judgment leads to tendency of using piracy software due to their morality level accept to use piracy software. There are no big deals or legal issues to use piracy software for them. FOSS is legally, morally and ethically to download through internet, the users only need to access to internet and download the various FOSS applications accordingly to their needs. Furthermore, FOSS can encourage the sharing spirit (high moral culture) as the founder wish to.

Moreover, FOSS can used to eliminate the "pirate culture" in individuals, households and organisations. The intention of people using pirated softwares instead of proprietary softwares is to reduce the cost. Proprietary software such as Microsoft Office, the cost for Microsoft Office Home & Student 2013 package is US$139.99 or approximately RM440 and Microsoft Office Home & Business 2013 is worth of US$219.99 or approximately RM690 for a single PC license. The cost of proprietary software is considered expensive and burden for users in Malaysia, while the cost of pirated Microsoft Office 2013 software only cost of RM5 to RM12 depend on the price setting of the computer store. However, piracy software is illegally and unethically to owe and use for any purpose, anytime and anywhere (Copyright Act 1987). Therefore, FOSS is actually no license cost occurred; the users only need to access to internet and download the various FOSS applications accordingly to their needs.

Nevertheless, FOSS enables to increase the adoption of ICT. Pavic, *et al* indicated the adoption of IT by SMEs is still lower than expected [12]. Several barriers to IT adoption have been identified including lack of knowledge about the potential of IT, a shortage of resources such financial and expertise and lack of skills [2]. Although Internet is widespread, people can search anything through search engines such as Google anytime and anywhere as long as access to WIFI or 3G. However, not every people know how to do that so especially those elder generation people (generation X) who received less education background due to poor IT skills [12].

IT is considered as complexity and expensive tool for them. With FOSS, the no cost software, every user can learn to use any IT application any purpose, anytime and anywhere without paying to the license fees. There are many famous and successful application of FOSS. Some famous and successful examples of FOSS are Apache, Mozilla, OpenOffice.org, GIMP, Lightworks, Ubuntu and more.

2.1.2 Limitation of FOSS:

Ballardini R.M. indicated the fact that the source code is open can also bring some unavoidable disadvantages, as the developers have limited opportunities to earn monetary returns for their investments. Even though non-pecuniary rewards might provide some motivation, but the limited economic benefit can reduce the supply of efforts devoted to FOSS.

Furthermore, it is worth noticing that some companies tend to avoid digging into the source code of large FOSS unless absolutely necessary. Widely used FOSS packages usually include very large source codes, therefore it is difficult to try to change the parts of source codes especially for those not familiar with the IT programmer unless they are technical expertise.

The awareness and adoption of FOSS are still very low. Based on the increasing piracy software rate, the result apparently showed that people used pirated proprietary software instead of FOSS. The scenario actually could bring to the risk of loss interest among the developers of FOSS, whereby they lost their faith and interest in developing or improving more FOSS.

2.1.3 Implication of FOSS in Education:

W.T. Tan hypothesized that there are significant relationship between applications of FOSS and impacts on education. The research indicated that there are various benefits that may be influential to education in India. It is a successful initiative of FOSS in schools in Kannur, Kerala, India where a project was introduced. Each school initially received a serve and 3 to 5 workstations. The project gave significant result of substantial savings as more computer facilities could be set up in more schools even 43 government schools had access to their own computer by running GNU/Linux with numerous FOSSES.

The survey of FOSS in tertiary institutions is extended to enhance the significant relationship. Staff of the School of Computer Science and Software Engineering of the University of Western Australia conducted a survey and reported the results in February 2004. 34 tertiary institutions in Australia, New Zealand and the UK provided feedback for the survey. The number of respondents was from ranged from 10 to 18,000. 78% of respondents reported that having staff with skill in FOSS. 87% of the respondents said there is equivalent or better support available for FOSS. 68% said that the support requirements of FOSS are not higher than proprietary software and FOSS is sometimes easier to support. The survey is shown that FOSS has already made significant inroads into tertiary institutions in Australia, New Zealand and the UK with 94% of the respondents indicating that they are already using FOSS [20].

Furthermore, Justina Hsu emphasized on the development of FOSS on campuses in Taiwan, and its local significances and the difficulties encountered in the promotion. The development of FOSS was begun as OSSACC (Open Source Software Application Consulting Centre) which provide consulting services for schools and teachers since 2003. However, the development of FOSS was inconsistency effort and motivation from local universities even though the authority association (Business Software Alliance) sent warning letter and local government organised anti-piracy campaign. As the anti-piracy campaign went away, the promotion of FOSS lost its strong drive due to the cooperation agreement with proprietary software companies. Moreover, the unfamiliarity with FOSS, expectations of teachers, poor integration with software, poor participation and sharing on FOSS, and lack of social free culture are also the difficulties (humanitarian aspect) of promotion in FOSS.

Davaa T. *et al* researched on the benefits of FOSS in education of Mongolia. FOSS adopted in Mongolia in frame of Sakura project since 2001 in collaboration of the Ministry of Education, Culture and Science Mongolia (MECS), and Japan International Cooperation Agency (JICA). The project faced difficulties even though 65-second hand PCs were installed at 65 secondary schools in rural Mongolia due to lack of equipment, teachers, technical support, budget and poor communication infrastructure. However, the study demonstrated that FOSS eventually helped to teach the basis of computer literacy curriculum and also resulted in cost savings for the schools. It also obviated the need to ensure that sufficient licenses are purchased as software can be installed in as many computers as necessary, the students able to install their own computers without restrictions. The researchers found that those students who have not been exposed to computers are likely to be more receptive to FOSS and would be desirable to start using FOSS as early as possible.

A study on strategic analysis towards deriving competitive advantage with the use of FOSS in South African universities with specific reference to Tshwane University of Technology (TUT) was conducted. The study emphasized on the theory, benefit, problems and successful implementation of FOSS. The study also indicated the usage of FOSS for fixed IT, Mobile IT and Telecommunication or Internet use showed the potential for unlimited use of FOSS in South Africa. The study point to enabling factors that enable TUT to make the best of the opportunities towards deriving competitive advantage especially with institution's abundant human resources and minimal financial resources. Yet, they estimate that the revolution and awareness level of FOSS in South African will be increased through the effort of local universities and government (Dehinbo K. *et al*, 2012).

2.1.4 Implication of FOSS in Information System (IS):

The DeLone & McLean Information System Success Model has become a standard for the specification and justification of the measurement in the research [4]. The DeLone & McLean IS Success Model is published in 1992, was a theoretical and empirical IS research conducted by a number of researchers in the 1970s and 1980s, since then over 150 articles have referred to and made use of. The role of information system is changed rapidly from last decade to recently [6]. The model consists of six interrelated dimension of success:

a) system quality
b) information quality
c) use
d) user satisfaction
e) individual impact
f) organizational impact

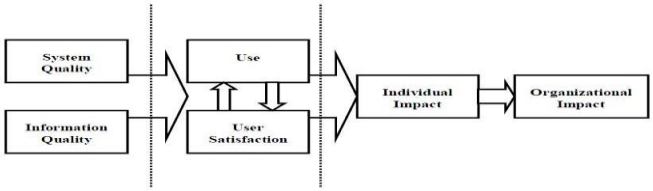

Fig. 2.1: DeLone and McLean IS Success Model, originated in 1992.

Measure of success	Indicators	Audience
System and information quality	Code quality (e.g. understandability, completeness, conciseness, portability, consistency, maintainability, testability, usability, reliability, structuredness, efficiency) Documentation quality	Users, developers
User satisfaction	User ratings Opinions on mailing lists User surveys	Users, developers
Use	Use (e.g. Debian popularity contest) Number of users Downloads Inclusion in distributions Popularity or views of information page Package dependencies Reuse of code	Developers
Individual and organizational impacts	Economic and other implications	Users, developers

Fig. 2.2: Success measures suggested by IS Success Model.

Despite the multidimensional and contingent nature of IS success, an attempt should be made to reduce significantly the number of different measures used to measure IS success; more field-study research should be investigated. Thus, DeLone and McLean revisited the model and reformulated the IS success model in 2002 (Figure 2.3).

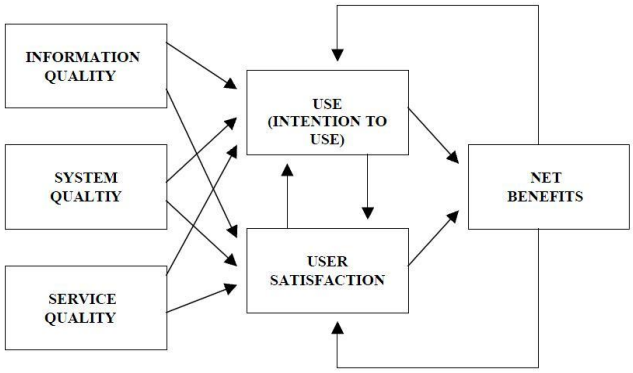

Fig. 2.3: Reformed DeLone and McLean IS Success Model.

As conclusion, the changes in the reformulated IS Success Model are largely changes in degree, not in kind. The addition of Service Quality and the collapsing of Individual Impacts and Organisational Impact into Net Benefits still preserve the parsimonious nature of the Model [6]. The research is summarized that existing nature of IS Success Model to suggest a range of potential success measurement of FOSS. However, a number of measures are inapplicable while others are difficult to apply in the FOSS environment [4].

Gangadharan G.R. *et al* indicated the proliferation of service-oriented computing $(SOC)^2$ is required to consider service ownership and distribution. An approach that similar to FOSS that opens the accessibility of a service's source code, execution, and use would significantly enhance the understanding of the service-composition process and create derivative services. Adopting and adapting the principles of FOSS to SOC could enhance the widespread use of services. Free/open services significantly enhance service use and distribution. F/O service allows any application of service-oriented or not depend the use of its service in agreement with license. Besides, F/O service allows distributing the service and freedom to improve the service and release the improvements to the public. F/O service characterised in the different approaches and focus on three dimensions:

- Interface modification – a common scenario in SOC, because the source code of service interfaces is generally available.

- Implementation modification – the source code is able to modify and create value-added services beyond composition.
- Execution independence – the service can be executed in a different context or owned that and maintained by a different organization.

Six scenarios SA to SF are used to exemplify the F/O services using various combinations of the three dimensions (Figure 2.4).

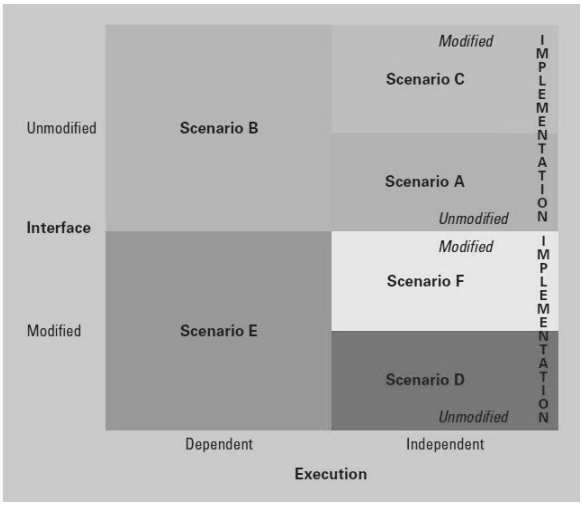

Fig. 2.4: Exemplifying freedom and openness in F/O services.

2.1.5 Implication of FOSS in Medicine:

Papadopoulou O. indicated the evaluation of four FOSS Digital Imaging and Communications in Medicine (DICOM) tools focusing on different aspects. The four FOSS DICOM tools that were used for compare were Eview box, GIMIAS, ImageJ and MITK 3M3 while the aspects were information in the program, career development process, user interaction, technical aspects of the software and materials, support, source code, information about the program, and processing and analysis features.

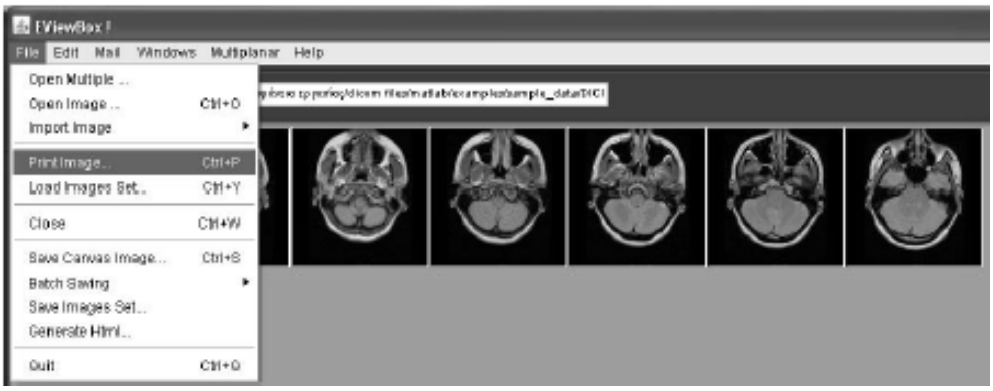

Fig. 2.5: Eview Box.

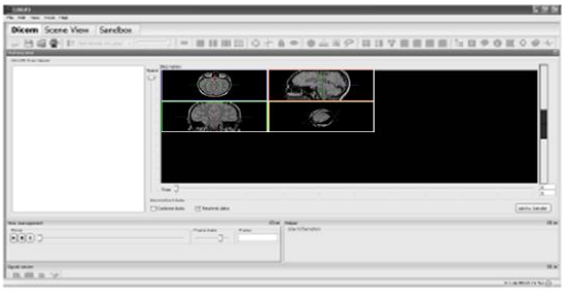

Fig. 2.6: GIMIAS.

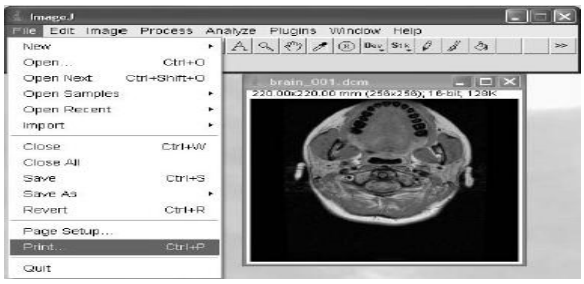

Fig. 2.7: ImageJ.

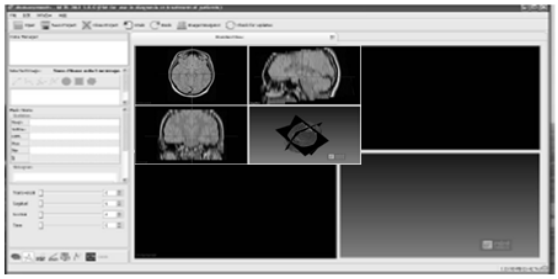

Fig. 2.8: MITK 3M3.

As conclusion, there is huge variety of available DICOM viewers. The users should take into consideration not only the quality of the features and tools that every application provided but should also look for other important information such as support provided, ease of use and practicality of the user guide, popularity of the respective application, maturity, professional and well written code and organisation of the tools and the Graphical User Interface (GUI).

2.2 Small and Medium Enterprise (SMEs):

As in other countries, small and medium enterprises (SMEs) are a very heterogeneous group. They play a vital role in shaping the future economy and even considered as the backbone of industrial development in our country due to involve in activities ranging from petty traders, grocery store operators, medium-sized contract manufacturers supplying parts and components to multinational corporations and professional services such as software firms or medical researchers selling their services to overseas markets (Alam, S. S. *et al*, 2007).

Definition of SMEs varies across countries, but Malaysia defines an enterprise is considered as an SME based on the annual sales turnover or number of full-time employees. An SME in the manufacturing sector is defined as an enterprise with full-time employees not exceeding 150 employees or with annual turnover not exceeding RM 25 million. On the other hand, SMEs in service and primary agricultural sector and ICT are enterprises with full-time employees not exceeding 50 or annual turnover not exceeding RM 5 million. The SMEs in both sectors are further categorized into medium, small and micro enterprises (SME Corp website).

	Category	Micro-enterprise	Small enterprise	Medium enterprise
1.	Manufacturing, manufacturing-related services and agro-based industries	Sales turnover of less than RM250,000 *or* fewer than five full-time employees.	Sales turnover between RM250,000 and RM10 million or between five and 50 full-time employees.	Sales turnover between RM10 million and RM25 million *or* between 51 and 150 full-time employees.
2.	Services, primary agriculture and information and communication technology (ICT)	Sales turnover of less than RM200,000 *or* fewer than five full-time employees.	Sales turnover between RM200,000 and RM1 million *or* between five and 19 full-time employees.	Sales turnover between RM1 million and RM5 million *or* between 20 and 50 full-time employees.

Fig. 2.9: Definitions of SMEs in Malaysia, SMIDEC.

The total established amount of SMEs in Malaysia was 645,136 in 2010 which had increased 17.67 per cent from the reference year 2003.

	Census of Establishments and Enterprises 2005 (Reference Year 2003)			Economic Census 2011 (Reference Year 2010)		
	SMEs	Large Firms	Total	SMEs	Large Firms	Total
Number of establishments	548,267	4,537	552,804	645,136	17,803	662,939
Percentage share to total establishments %	99.2	0.8	100	97.3	2.7	100

Fig. 2.10: Total established SMEs, Economic Census 2011.

Most of the SMEs were microenterprises, forming 77 per cent of the total SMEs in Malaysia in 2010 while 79.3 per cent in 2003. Meanwhile, Small-sized SMEs accounted for 20 per cent and medium-sized SMEs constitute the balance of 3 per cent (Figure 2.11). There was an increase of 14.1 per cent of microenterprises; 28 per cent of small SMEs and 56.4 per cent of medium SMEs.

	Census of Establishments and Enterprises 2005 (Reference Year 2003)				Economic Census 2011 (Reference Year 2010)			
	Micro	Small	Medium	Total	Micro	Small	Medium	Total
Number of establishments	434,939	100,608	12,720	548,267	496,458	128,787	19,891	645,136
Percentage share to total SMEs,%	79.3	18.4	2.3	100	77.0	20.0	3.0	100
Percentage share to total establishments,%	78.7	18.2	2.3	99.2	74.9	19.4	3.0	97.3

Fig. 2.11: Number of establishments and percentage share of SMEs by Firm Size.

SMEs' concentration in the services sector increased from 87 per cent to 90 per cent; meanwhile increase 6 per cent in manufacturing sector, followed by 3 per cent in construction sector and the remaining 1 per cent in the agriculture sector and 0.1 per cent in the mining and quarrying sector. The significant change is that the share of SMEs in the agriculture sector has declined substantially from 6.2 per cent previously to 1 per cent.

Number of establishments	Census of Establishments and Enterprises 2005 (Reference Year 2003)				Economic Census 2011 (Reference Year 2010)			
	Total	SMEs	Percentage of SMEs over total	Percentage of SMEs over total SMEs	Total	SMEs	Percentage of SMEs over total	Percentage of SMEs over total SMEs
Services	477,525	474,706	99.4	86.6	591,883	580,985	98.2	90.0
Manufacturing	40,793	39,373	96.5	7.2	39,669	37,861	95.4	5.9
Agriculture	34,486	34,188	99.1	6.2	8,829	6,708	76.0	1.0
Construction	-	-	-	-	22,140	19,283	87.1	3.0
Mining & Quarrying	-	-	-	-	418	299	71.5	0.1
Total Establishments	552,804	548,267	**99.2**	**100**	662,939	645,136	**97.3**	**100**

Fig. 2.12: Number of Establishments by Sector and Percentage share to total SMEs and Establishments.

Based on the SME Economic Census Report 2011, which was conducted by the Department of Statistics, showed there has been an increase in the share of SMEs in the State as compared with the shares recorded during the SME Economic Census Report 2005 which included the Northern Region. SMEs in Northern Region of Malaysia included Perlis, Penang, Kedah and Perak which covered about 22.1% of the total SMEs in Malaysia.

State	Census of Establishments and Enterprises 2005 (Reference Year 2003)	Economic Census 2011 (Reference Year 2010)	Percentage point increase / decrease
Selangor	18.0	19.5	+1.5
Kuala Lumpur	17.7	13.1	-4.6
Johor	10.3	10.7	+0.4
Perak	8.0	9.3	+1.3
Sarawak	6.0	6.8	+0.8
Sabah	4.5	6.3	+1.8
Pulau Pinang	4.9	6.3	+1.4
Kelantan	6.5	5.9	-0.6
Kedah	6.8	5.7	-1.0
Pahang	5.1	4.6	-0.5
Negeri Sembilan	3.2	3.8	+0.6
Terengganu	4.3	3.5	-0.8
Melaka	3.6	3.4	-0.2
Perlis	1.1	0.8	-0.3
Labuan	-	0.3	+0.3
Putrajaya	-	0.1	+0.1

Fig. 2.13: Percentage share of SMEs by State in 2003 vis-à-vis 2010,%.

2.3 ICT Adoption among SMEs in Malaysia:

Globalization and rapid changes in driven technology have created a new economy. In conjunction with this, Information and Communications Technologies (ICT) is undoubtedly the critical enabler of a knowledge-based economy now. ICT is a key catalyst for emergence of the new economy, both as a sector and enabler for enhancing efficiency and productivity. Malaysian Government across the globe has recognized the positive impact ICT on economic and social development [8]. ICT sector grew to contribute about RM 7.35 billion to the GDP in 2009 and its indirect contribution grew to about RM 2.48 billion in the same year. The sector employed more than 200,000 people over all and prospect to rise to about 300,000 people by 2013. Consequently, piracy software has become main issues of dropping the growth of ICT.

As of August 2010, the total amount of companies had registered in SME site (smeinfo.com.my) is 16,732 under six categories such as Manufacturing, Services, Construction, Agriculture, Mining and Quarrying. Three quarter of SMEs (73%) did not use ICT in conducting their business. For those firms who did use ICT, two-thirds of them (67%) utilised Internet in the businesses. However, only 12% of them have their own websites.

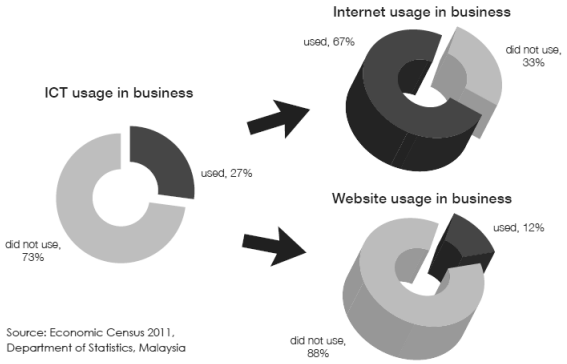

Fig. 2.22: ICT usages by SMEs in Malaysia.

A previous study was conducted in 2007 which show that SME owners possess very poor Information Technologies (IT) and rarely employ the Internet at the workplace among the SMEs in Malaysia [12]. The study also shown that SMEs owner's IT skills, IT usage, and advancement characteristics are significantly correlated to their IT adoption in SMEs. However, as SMEs are not large organisations, the size of SMEs is sometimes seen as a barrier to IT adoption and there is a common perception that an organisation has to be large in order to gain the benefit and flexibility available.

In a nutshell, there are many researchers done on the phenomenon of FOSS development by theoretical and practical and its benefits in various areas in enhance the economic, but yet in Malaysia due to less awareness of FOSS. The literature reviewed in this chapter is related to the basis, benefits and limitations of FOSS, previous studies or researches and ICT adoption among SMEs in Northern Region of Malaysia. The main issues addressed by the literature were studied to provide a specific understanding the factors influencing the use of FOSS among SMEs in Northern Region of Malaysia.

3.0 Research Methodology:

This research is based on quantitative research to investigate the significant relationship between among the variables. Questionnaires were used as a medium for getting information. About 150 sets of close-ended questionnaires distributed among the Small and Medium Enterprise (SMEs) in Northern Region of Malaysia. SMEs in order to get their feedback toward their perception of software, FOSS and criteria that concerned in FOSS. A simple random sampling is used which allows equal presentation and selection of samples. The subjects were drawn randomly from Chief Executive Officer (CEO), General Manager (GM), Department Manager (DM), Supervisor, technicians and staffs from the management team among SMEs in Perak, Penang, Kedah and Perlis.

The questionnaire in this research was divided into five main sections. The first section was on the demographic data of the respondents. Nominal Scale is use for the total of eight questions which include gender, race/ethnicity, age, religion, marital status, occupation, highest education and income status. The second section consisted organisation information of respondent. Nominal Scale is use for the total of three questions which include type of SMEs, geographical and established period. It is believe that these variables would have a strong influence on the SMEs' selection of FOSS. The third section was on knowledge and awareness of FOSS, nominal Scale is use for the total of six questions to investigate the respondents' knowledge and awareness of FOSS. While the fourth section consisted of an eleven Likert-scaled items with five-point scale: 1 (Strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) and 5 (Strongly Agree).The fifth section also contained twelve questions with five-point scale: 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) and 5 (Strongly

Agree). The last section contains twenty questions which were mixed with nominal scale and the five-point scale: 1 (Strongly Disagree), 2 (Disagree), 3 (Neutral), 4 (Agree) and 5 (Strongly Agree).

4.0 Research result:

4.1 Overview of Data Gathering:

A total of 150 questionnaires were distributed among randomly the randomly selected respondents. However only 100 questionnaires were collected back, which made up 66.7% of total questionnaires distributed were satisfactorily completed and tested by using the Statistical Package for Social Sciences (SPSS) software. 66% of the respondents were male and the remaining 34% were female. Majority of the respondents were Chinese (45%), aged between 23 – 27 (25%), Muslim (36%), married (59%), educated in Degree (51%), Chief Executive Officer (30%) and income status between RM 3,000 – 3,999 (31%). On the other hand, most of the SMEs were services industries (44%), equally located in Perak, Penang, Kedah and Perlis (25%), and establishment period for 3 – 4 years (42%).

A total of 70 the respondents were not heard of FOSS before (70%) and 30% were heard and aware of FOSS. Majority of the respondents (57%) were willing to know more about FOSS, 27% of respondents were not answered due to they had known well about FOSS and remaining 16% were not willing to know more about FOSS due to not interest, no time and no knowledge about FOSS. Based on the total 30 of respondents who knew about FOSS, majority resource of knowing about FOSS were conference or workshop (10%) and Academics (10%), followed by Internet (5%), Magazine or Journals (2%), Work colleagues (2%) and the remaining 1% were through Friends. The understanding level of FOSS among the 30 respondents were high whereby majority of them understand that FOSS is freely distributed to anymore, able to access to source code, able to modify source code, able to redistribute the modified and no need license fees.

Moreover, 7% of them were slightly aware of FOSS, another 7% of them were highly involved in FOSS, 6% of them sought information of FOSS, but need further information, another 6% were investigated and decided to use, and the remaining 4% were no interest to use FOSS. Furthermore, the total of respondents (30%) who knew about FOSS was fully aware of FOSS packages (GNU/Linux, Apache, OpenOffice.org, Mozilla, GIMP, and Ubuntu).

The Information Technologies (IT) services were asked to measure the relationship between the IT development in organisation of respondents and usage of FOSS. A total 63 of respondents were owned their own IT services (63%) and the remaining were not owned their own IT services (37%). Majority of them were used proprietary software companies or paid supplier (47%), followed by self (24%), in-house staff (20%), websites (5%), friends or relatives (1%) and other (3%).

A total of 60 respondents were not using FOSS packages now but not decided yet (60%), 29% of respondents were currently using the packages of FOSS, 9% of respondents were not using packages of FOSS and not planning to use in the future as well, and the remaining 2% of respondents were planning to use within next year. Moreover, a total of 76 respondents were not undergone the training now and not planning in the future (76%), 14% of respondents were currently training of using FOSS, 6% of respondents were planning to train within next year, and the remaining 4% were trained before but not anymore due to they were graduated.

A total of 93 respondents would like to use OpenOffice.org instead of Microsoft Office and the remaining 7% of respondents resist to use due to get used with Microsoft Office, no interest and no computer. Then, 90% of respondents would like to use GIMP in order to replace Adobe Photoshop and the remaining 10% were insisted to use due to no interest, no computer and no familiar.

Next, a total of 93 respondents would like to use Ubuntu in order to replace Window and the remaining 7% of respondents resist changing due to get used with Window, no interest and no computer. Moreover, 90% of respondents would like to use Lightworks in order to replace FinalCut Pro and Adobe Premiere and the remaining 10% were insisted to use due to no interest, no computer and no familiar.

A total of 96 respondents were understand the role and function of FOSS after the survey (96%) and the remaining 4% respondents were still not understand due to no interest and no computer. In a nutshell, majority of respondents would consider using FOSS (96%) and the remaining were not considering due to no interest and no computer (4%).

4.2 Reliability Analysis:

The Cronbach's coefficients alpha values for all factors that ranged from .6005 to .7794 indicated good inter-item consistency for each factor. Sekaran [19] explained that reliability of a measure is established by testing for consistency and stability of data collected. Consistency of data shows the degree an item is independently measured of a concept. Reliability analysis was used to measure the goodness of data. Cronbach's alpha was the measurement. According to Sekaran [19], alpha over 0.80 is considered good, whereas range of 0.70 is considered acceptable.

Table 4.1: Result of Reliability Test.

Variables	Number of Items	Items Dropped	Items Recoded	Cronbach Alpha
Knowledge and awareness of FOSS	10	-	3	0.694
Perception of Software	11	-	-	0.773
Perception of FOSS	12	-	-	0.940

4.3 Findings:

Referring to the table below, the mean for all variables ranges of 1 to 5. The mean and standard deviation for the variables measurement in respondents' Perception of Software are shown in Table 4.2.

Table 4.2: The Software's perception of respondents.

Factors	Mean	Standard Deviation
Software is important (D18)	4.2200	0.83581
Software is easy to use (D19)	3.7800	0.81128
Software is high performance (D20)	4.2500	0.68718
Software is high stability(D21)	4.1700	0.66750
Software is high security protection (D22)	3.3100	0.96080
The resource of software is easily get (D23)	3.9000	1.20185
Software is proprietary (original) software (D24)	3.0000	0.84087
License of proprietary software renews annually (D25)	2.8100	0.82505
Software is mostly download through online (D26)	4.1300	0.82719
Software is right to download without paying (D27)	3.9200	1.16063
Software is safe to download through online (D28)	3.9900	1.01995

The result showed that the respondents believe of the software is importance, easy to use, high performance, high stability, easily to get the resource, downloaded through internet, right to download without pay and safe to download through internet. Meanwhile, the respondents not sure about the security protection of software, software is proprietary software, and the need of renew proprietary software's license annually.

Moreover, the respondents believe that FOSS is free and no license fees, FOSS can be downloaded through internet and download without paying. While, they are not sure that FOSS is important, easy to use, high performance, high stability, high security protection, multi-functionality, allow modifying the source code, legal to redistribute, and high potential application and software due to they are lack of knowledge and awareness of FOSS.

Table 4.3: FOSS's perception of respondents.

Factors	Mean	Standard Deviation
FOSS is important to you (E29)	3.1000	0.81029
FOSS is easily to use (E30)	3.3000	0.75879
FOSS is high performance (E31)	3.3700	0.64597
FOSS is high stability (E32)	3.3600	0.64385
FOSS is high security protection (E33)	3.2300	0.6333
FOSS is multi-functionality (E34)	3.5300	0.59382
FOSS can be modified the source code (E35)	3.4000	0.69631
FOSS is free and no license fees (E36)	3.7000	0.61134
FOSS can be downloaded through online (E37)	3.7600	0.66848
FOSS is legal to download without paying (E38)	3.7100	0.65590
FOSS is legal to redistribute and share (E39)	3.5300	0.71746
FOSS is high potential applications and software (E40)	3.5800	0.68431

Nevertheless, the respondents strongly agree that free and no license fees, and freedom to run for any purpose are the major factor to considerate of using FOSS in their SMEs; and they also agree that other criteria of FOSS (freedom to distribute, freedom to modify the source code, freedom to redistribute, developed by various developers, high performance and stability, high security protection, legal to download, use and distribute, and ethically to use, distribute and contribute knowledge) is concerned as well in their decision making.

The Spearman's rho correlation is used for looking the significant relationship between the nonparametric variables in factors influencing the use of FOSS among the respondents (SMEs) in Northern Region to prove the reliable of the research.

Table 4.13: Factors influencing the use of FOSS of respondents.

Factors	Mean	Standard Deviation
Free and no license fees (F45)	4.7000	0.46057
Freedom to run for any purpose (F46)	4.5800	0.58913
Freedom to distribute copies to others (F47)	4.3200	0.82731
Freedom to study and modify the source code (F48)	4.2700	0.90849
Freedom to redistribute the modified copies (F49)	4.0900	1.0550
Developed by various reliable developers(F50)	4.4200	0.98658
High performance and stability (F51)	4.6500	0.50000
High security protection (F52)	4.6300	0.50562
Legal to download, use and distribute (F53)	4.6300	0.56237
Ethically to share, distribute and contribute knowledge (F54)	4.5100	0.73161

Table 4.14: Spearman's rho correlation relationship between nonparametric variables in factors influencing the use of FOSS among the respondents.

		per_soft	per_fosssoft	F41	F42	F43	F44	F55	F56	F57	F58	F59	F60
per_soft	Correlation Coefficient	1.000	.384**	-.237**	-.359**	-.324**	-.381**	-.336**	-.366**	-.336**	-.366**	-.223*	-.308**
	Sig. (1-tailed)	.	.000	.009	.000	.001	.000	.000	.000	.000	.000	.013	.001
	N	100	100	100	100	100	100	100	100	100	100	100	100
per_fosssoft	Correlation Coefficient	.384**	1.000	-.222*	-.277**	-.581**	-.562**	-.155	-.182*	-.155	-.182*	-.115	-.195*
	Sig. (1-tailed)	.000	.	.013	.003	.000	.000	.061	.035	.061	.035	.127	.026
	N	100	100	100	100	100	100	100	100	100	100	100	100

Conclusion:

The analysis of this research had proved that individual characteristics, organisation characteristics, knowledge and awareness of FOSS, perception of software, perception of FOSS and criteria of FOSS are important in influencing the use of FOSS among SMEs in Northern Region of Malaysia. All factors that have been identified from results will influence the SMEs to use FOSS. In a nutshell, the individual characteristics, organisation characteristics, knowledge and awareness of FOSS, perception of software, perception of FOSS and criteria of FOSS for this study can be concluded that it is reliable and relevant in achieving good understanding of factors influencing the use of FOSS among SMEs in Northern Region of Malaysia.

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