

# Software Systems Versus Intellectual Property Rights

## *A Moral and Ethical Challenge for Higher Education in Developing Nations*

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**Keywords:** Computer Systems, Software Systems, Intellectual Property Rights, Higher Education Institutions, Software Piracy.

**Abstract:** Higher Education (HE) institutions in most countries represent one of the most important users of computer systems. HE institutions need access to fast and reliable computing devices, not only to teach, but also for their day-to-day operations. These systems are not just hardware, but also software systems which are protected by national and international laws. HE institutions may be able to control their employees and their software needs, but it is far more difficult to control students. Their software needs to enforce the respect of intellectual property rights. Students need numerous software packages in order to successfully comply with the academic requirements, whether deliberate or not, some students rely on illegally acquired software systems for their academic projects. This type of behaviours has moral, ethical, legal and societal replications. HE institutions are seen as law-abiding entities, highly respected by their respective communities, applauded by industries, recommended by their governments, and yet their students may be jeopardising that status whether deliberately or by pure ignorance. This study aims at investigating why students engage in using illegal software systems, and why it is difficult to enforce the rule of law when it comes to software licences within HE institutions.

## 1 INTRODUCTION

This section will introduce the importance of higher education worldwide, the role it plays in developing people and communities, and the challenges HE faces in order to stay competitive and up to date with the latest telecommunication tools. We will also explore the importance of computing systems in HE, the role of software systems, the important duty of protecting intellectual property, and most importantly we will investigate the challenges that most Information Communication Technology (ICT) students faced in staying within the framework of laws, while fulfilling their academic obligations.

HE institutions all over the world have acquired high levels of respect and accountability from their respective governments and other national institutions for their role in creating new knowledge and research in all aspects affecting their respective nations (Rensburg, 2013a). However, learning centres are negatively affected by continuous government budget cuts, lack of external financial assistance and the impact of austerity measures taken to address the respective country's fiscal

issues, especially from the ministries of education, or other external donors (Rensburg, 2013b). Some institutions need to enrol as much as possible the highest of number of students, in order to obtain government grants and to ensure a higher financial return. Potential students usually choose a particular stream based on the employment opportunities after graduation, and in the past decade (,) the field of ICT has become the most sought-after field by school leavers who wish to ensure a better future.

In order to produce the best ICT students, the institution needs to be well-equipped with the latest and state-of-the-art ICT tools in addition to having the best academic staff to groom the potential ICT graduates and future industry experts. This means that the best computer laboratories, latest software systems and permanent maintenance personnel need to be in place in order to monitor all student activities.

This study was initially conducted as part of a master's degree research study aiming at exploring the viability and adoption of open source software systems as an alternative in higher education in developing nations. This paper investigates the

driving force behind the use of pirated software systems in HE institutions in developing nations.

## 2 UNDERSTANDING COMPUTER SYSTEMS

A computer system is an electronic device comprising thousands of electronic chips and microchips. Electronic microchips are now also widely incorporated into systems ranging from heavy industrial machineries to miniature handheld computer systems. Generally speaking, a computer system consists of two major components, namely: hardware and software (Meyers, 2003a). The former is regarded as the physical component of the computer system, receiving and executing instructions embedded within the latter (Cashman et al, 2011). Software systems on the other hand, comprise digital algorithms which are sets of instructions that control the hardware components of the computer system (Meyers, 2003b).

Programmers, developers or coders write the coded algorithms and these instructions are translated into a form that only electronically enabled machines can read and execute (Parker & Van Alstyne, 2005). This initial authoring is known as the source code which represents the actual human intelligence instructions. The source code can be accessed, modified, enhanced and innovated by trained persons (Hershey, 2008). The source code can be accessed by the general public. However, this will depend on the licence agreement and its release terms and conditions (Parloff, 2007a). After the compilation, that is the process of transforming human readable code into machine readable code, another authoring is generated, known as the object code. This is a form of authoring that is readable and executable by the machine only (Reijswoud & Mulo, 2004; Toko & Mnkandla, 2011a).

To some degree, the source code is regarded as the actual software system, and users have access to it through purchasing a licensing agreement with its vendor or developers. Regardless of what the licence and agreement stipulates, the users cannot modify it (Parloff, 2007b). Both sets of authoring (source code and object code) constitute the software system the end-user purchases or downloads free of charge from the Internet for whatever purpose (Stallings, 2003).

The vendors, developers and programmers have the freedom to release their product under any licencing agreement of their choice, to define the

conditions under which their software systems will be used, the manner in which users will access it and how much users will pay to use it. These factors are protected by Intellectual Property Law (IPR) and usually constitute patent rights (Lau, 2003) thereby preventing other developers, programmers or vendors from copying it. The right to use the software systems is therefore limited in access to the executable component (West & Dedrick, 2005). This means that although the end-users may purchase the software, it does not provide them with the right to modify, compile, innovate or redistribute it (Weber, 2002). This form of release condition is known as 'proprietary' had stringent terms and conditions agreement (Steinmueller, 2001), an example will be any Microsoft product . Other vendors may choose to release their software systems without any form of restriction, and all together (source code and object code) provide technically knowledgeable users with the chance of owning, innovating and redistributing the given software systems to meet a particular need (Hill, 2007). Technically this is often referred to as an 'open source' and example will be 'Linux' product. It is sometimes free of any initial cost and/or further licensing fees, and mostly distributed over the Internet (Parloff, 2007c). Software systems are therefore essential in the smooth running of a computing system without which a computer system will only be a piece of hardware with no utility.

## 3 INTELLECTUAL PROPERTY RIGHT

An intellectual property right is a law that protects any outcome of intellectual effort; it can be enforced locally or internationally in a court of law; it can be granted to a person, group, company or entity, and enables them an exclusive right to exploit for their own benefit any positive benefit without having to keep a watchful eye on competitors who may simply copy their invention, creation or innovation (Karakaya and Uluturk, 2010). The use of such laws limits any form of imitation or duplication by conferring monopoly power to the holder. In most cases, it may comprise full or sectional rights, and can include, but is not limited to copyright, patents, trademarks, geography indication, related rights, author rights, moral rights or trade secrets (WIPO, 2004). The reasoning behind these initiatives is to motivate people to generate new ideas, and to protect them and their creations and subsequently

motivate others to compete on an equal footing. For example, a copyright gives the exclusive right to reproduce, distribute, perform, display, or license a particular work of the inventor if required, and thus constitutes a licensed derivative of his work (Olsson, 1993). Generally speaking, the enforcement and protection of intellectual property rights at international level has always been a complex issue, and depends on each country and most importantly on the type of political climate in each nation which may have an impact on the extent to which these laws are enforced.

Software systems are known as the creation of the human mind, and in most cases they are developed by individuals or companies with important patent rights. The majority of software systems these days are proprietary and represent a foreign product in most developing nations where they are most of the time formally protected by local laws, whereby the use and reproduction need to be authorised by the licensor (Idris, 2003).

#### 4 SOFTWARE LICENSING

Regardless of how a person acquires a proprietary software system and some open source systems, for example from the internet or via CD, DVD or USB, during the installation process there will be a stream of different screens to go through before the actual software system is loaded onto the machine, and one of these screens will deal with the terms and conditions. These will stipulate the conditions under which the product that is about to be installed can be used. It is assumed that if the user cannot comply with these conditions, the software shall not be installed. Ironically, even when the software system which is about to be installed has been acquired illegally, the same screen must be validated to move to the next screen, and this brings up the question of morality as the end-user is the only one to judge whether or not to continue with the process when realising that the product may have been illegally acquired (Hinduja and Sameer, 2003).

Software licensing is seen as a legal instrument governing the use and distribution of a software system, although today much of the distribution of software systems is made over the Internet which offers greater control. However, many, due to lack of Internet connectivity in most developing nations, are still distributed using hard material hence, the high rate of illegal redistribution of software systems in many homes, businesses and HE institutions (Depken II et al, 2004).

The terms and conditions of these software systems do not only restrict illegal copying, but also restrict loading the product onto various computers without the authorization from the vendor. The question is thus how can one make sure that a software licence that was legally awarded to a single computer is indeed installed on a single computer only? It is at this point that the issue of morality and ethics arises, and there are many who believe that many illegally installed software systems are originally acquired legally, and become illegal only when used beyond the restricted number of computing devices (Higgins et al., 2005). Software licensing in general contains various provisions which enable legal and structural liability between both parties (the licensee and licensor). Thus, even when the software has been acquired legally, the buyer does not have the right to modify, enhance, or innovate the source code of the product. And whether one is dealing with open source or proprietary software systems, there are always conditions that the end-users have to respect, and monetary values are not the only access conditions (Husted, 2000).

#### 5 CAUSES OF SOFTWARE SYSTEM PIRACY IN HE INSTITUTION

According to Musa Karakaya and Bulent Uluturk (2010), the “lack of information, poor administration and control of software installed on campus computer systems, poor moral standards, absence of academic ethics, poor commitment from academic staff about the respect of intellectual property, high price of proprietary software systems, and low level of understanding of country laws are the driving forces behind the high rate of piracy” in HE institutions. This neatly points to the fact that behind the software piracy phenomenon in various HE institutions across the many developing nations students are under immense pressure to complete academic projects using advanced and the latest software systems, very often, mostly at their own pace and with little supervision. Moreover, the price of such software systems is often beyond their reach, and outdated systems are discarded without further explanation. Indeed, many students are so poor they require financial help to fund their studies (Rensburg, 2013c). Moreover, many ICT streams do not offer legal subjects or modules to help students understand the repercussions of their actions or the legal implications of using pirated software. In many

cases academic staff at the universities are not equipped enough to easily trace project development with non-legal material; and most importantly various HE institutions do not have a clear policy regarding software piracy pertaining to students use even though they may have an acceptable policy for their staff.

## **6 ICT STUDENT AND USE OF ILLEGAL SOFTWARE SYSTEMS**

In South Africa, the National Qualifications Framework (NQF) is used to standardize university degrees and national diplomas, all of which are three-year qualifications with regard to Application Software Development, IT Management, ICT Management or Systems Support as major subjects. Every student registered for an NQF 4 is expected to submit a complete application that has been developed as part of their final project upon which the final evaluation is based (Faculty of Management Regulations, undergraduate and postgraduate, University of Johannesburg, 2012). For many, this moment remains the most memorable academic event with the presentation of their final application to the general public and ICT industry experts, the latter forming part of the jury.

Students facing this learning experience have to come up with a topic, an idea or a problem and develop a software application system to address or solve it. Thus a system needs to be generated by the compiler, or written or developed by someone else. Generally the project must be a student's original solution; they need to select the software system platform they wish to use and most importantly finance it which many can't afford. As a result, many, even in reputable universities, resort to using an illegal software system in order to complete their qualification. One of the aspects that stood out at the 2010 student exhibition was that most application systems had been developed using proprietary software products. It is important to note that the students were not bound to a particular computer system platform or expected to select a particular platform. Rather they were free to make use of whatever application system (e.g. compiler) or platform they found suitable. This was the case not only for their "front end" GUI, but also for their "back end" (database systems) or operating systems, thus meeting the objectives of South Africa's national plan for higher education which is: "To

produce graduates with the skills and competencies required to participate in the modern world in the 21<sup>st</sup> century" (Damoense, 2005a). When examining the final projects of the students, the part that first appears is the user interface front end. Nearly all the students chose applications related to Microsoft Visual Studio such as Visual Basic Dot Net (VB.NET), ASP.NET or C#, all of which are PS and Microsoft products. For the back end most decided on an SQL server, and again a PS, these being solid, reliable and robust.

## **7 OVERVIEW OF THE COST OF SOFTWARE SYSTEMS**

The cost of the software licensing fees in the developing world is reasonable compared to other imported ICT materials (Gush et al, 2004). Mostly evaluated in foreign currency (US dollars), it is estimated that licensing fees cost the Australian government around \$430 million annually (Scott, 2004). The Republic of South Africa spends 65% of its annual ICT budget on licensing-related costs (NACI, 2004). Worldwide licensing amounted to \$35 billion in 1998 and \$171 billion in 2000 (Evans, 2004).

For a developing country software licence fees can become a major hurdle for ICT and overall national development (Bruggink, 2003) with most of the vendors (software companies) operating from abroad or using subsidiary local entities to reach their end-users and provide technical support services (when necessary). As a direct result, large amounts of foreign currencies leave the country's shores annually (Ghost, 2003a). In South Africa the situation is similar to the rest of the developing world with the estimated software licence cost totalling around \$2,620 per GDP/capita (Ghost, 2003b). This untenable situation has resulted in a high volume of pirated software being used in many South African homes, schools, HE institutions and small businesses (Toko & Mnkandla, 2011b). It is estimated that over 38% of the total software used in South Africa is pirated (Ghost, 2003c).

## **8 EXAMPLE OF SYSTEMS COST IN HE INSTITUTIONS**

In 2007 the University of Johannesburg (UJ) developed a separate business entity to control and manage its computer laboratories with the aim of

making them more effective and efficient. The university is spread across four campuses around the city of Johannesburg, namely Soweto, Doornfontein and two campuses in Auckland Park: Bunting Road and Kingsway, each with its own computer laboratories. It is estimated that the software licensing fee for the Soweto campus alone is approximately \$56 980, for Kingsway approximately \$ 152 72, for Bunting Road approximately \$248 98 and for Doornfontein approximately \$82 55. This amounts to a total budget of approximately \$1 065 54 or \$152 220 US for the year 2008. At this stage these figures relate only to licensing fees for software such as *Ghost* and *DEEP FREEZE*, and do not include operating systems and other office automation systems. Software-related licence fees regarding staff are not included. If one had to expand this to office automation software such as MS Office, OS, antivirus, antispyware and Internet connectivity software, the cost of licensing would run into tens of millions of rand annually.

## 9 THE IMPORTANCE OF SOFTWARE SYSTEMS IN HE INSTITUTIONS

H.E institutions develop their internal infrastructures to meet their technological needs and to keep pace with their competitors, world trends, labour constraints, internal goals and the modern world (Damoense, 2005). According to Adams (2003, p18): “With few exceptions, universities have been unable to develop and implement programs, such as advanced research in networking, computer science, community applications, and programs that promote technology-savvy intellectual capital. Economic factors ranging from the lack of capacity to pay for costly infrastructure to sustaining computer networks introduced through donor funding weighed on universities as their budgets continued to get slashed.”-

ICT research and development have for years been an integral part of H.E institutions worldwide, and most importantly, these institutions have participated in many successful advanced ICT projects that have had a huge positive impact on the ICT industry and society in general (Câmara & Fonseca, 2005). The science and technology innovation that the world is currently experiencing is mainly driven by academic researchers upon whom industry researchers rely, not only to get

accreditation for their personal research findings but also to validate them, and obtain technical support and acknowledgement (Fresquez & Frias, 2006). Academics thus play an important role in creating awareness of intellectual property rights. Developing a community of law-abiding developers is thus seen as crucial for any respectable nation (Wooi, 2004). A particular example is the role scholars and academics have played in developing the UNIX operating system, one of the most reliable, stable, secure and free pieces of OS that has led to further software development around the world (Parloff, 2007d). The ICT academic world is also regarded as the human resource development ground for the ICT industry, helping to make H.E institutions a breeding ground for ICT industry professionals. Furthermore, the level of education or qualification is the most fundamental and reliable evaluation instrument used to determine the suitability of any candidate entering the sector (Damoense, 2005c). The qualification of the potential entrant is evaluated against university standards and monitored by the Department of Higher Education.

Up to now we have explored, explained and elaborated on various aspects pertaining to the role of software licensing, and motivations that drive the ever increasing number of pirated software systems in many H.E institutions - mostly in developing nations. Very often these H.E institutions from developing nations compete with first-world institutions, these ICT products are priced with set and standard consumers in mind. Thus, as a result of internal financial problems of many developing countries, illegal products are often used in some H.E institutions even though such actions are seen as immoral, unethical and unacceptable in all cultures. Nevertheless some H.E institutions are not only the repositories of knowledge, but some are indirectly promoting “white collar” criminal activities when “forcing” students to keep up to date with the latest technology which they can only afford by obtaining pirated software if they wish to succeed in their academic studies.

## 10 METHODOLOGY

The research study was conducted over a period of two years as part of a larger research project known as ‘The role of open source software in higher education institutions’ which is available online under the university of Johannesburg website. This type of research is generally classified as research project; it enables the researcher to develop solid

research literacy at a time when reliable academic data is non-existent in many developing nations. The method employed was exploratory followed by explanatory built-up research. For this particular research project, a quasi-experimental research design was used due to its nature and the aim of the project. The most important motivation for these choices was the ability to use a survey questionnaire over the Internet which could easily be distributed to people in the most remote locations in South Africa. The project was primarily conducted in the Republic of South Africa, although the outcome can be easily replicated in other developing nations around the globe.

A questionnaire was sent to various H.E institutions around the country and uploaded onto the Internet. The main sources of data were students, academics and ICT professionals operating in various H.E institutions around the country. The Internet thus enabled respondents to access the questionnaire wherever they were. Participants were randomly selected without targeting a specific group. The researcher drew the sample population from all corners and sectors of H.E institutions in the country, i.e. from people with both ICT and academic backgrounds. The stratified sampling method was used to obtain data for analysis. This selected approach is based on probability sampling which enables each participant within the target population an equal chance of being selected. The primary target was to reach at least 200 respondents from all sectors, namely ICT students, academics, professionals. Each question was designed to address a specific outcome which could help understand the problem at hand, and we received nearly 600 responses. The aim of the research project was to examine how students understood intellectual property rights in terms of software licensing issues.

## 11 FINDINGS

The survey questionnaire was completed online. Although the research questions addressed many software-related issues such as open source software systems versus proprietary systems, this paper will only deal with the question related to the understanding of intellectual property rights of software systems within H.E systems.

### Question 1

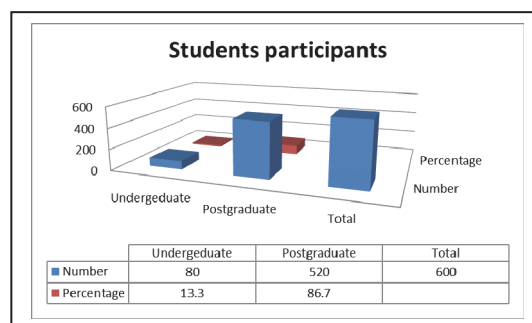


Figure 1: Student level of study.

Question: Please indicate if you are an undergraduate or postgraduate student.

**Analysis:** This question was primarily aimed at getting to know the students, to know whether they were undergraduates or postgraduates. It was assumed that postgraduate students are better equipped to understand the implications of using illegal systems, and those undergraduates still required more time to be informed about the dangers of using unlicensed products. We noted a large number of undergraduate students as compared to postgraduates who participated in this study. This was expected, because in most cases, as student progress academically, and graduate, they look for jobs and put any future studies on hold.

### Question 2

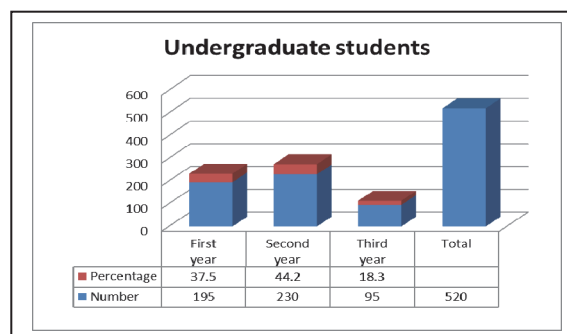


Figure 2: Sub-level within undergraduate student.

Question: If you are an undergraduate student, please indicate your current progress.

**Analysis:** This question is aimed at narrowing the focus to a particular sub-group. It was expected that undergraduate students would form the biggest group because as they progress through their academic studies, many students drop out of the system, thus resulting in a smaller pool of

postgraduate students. Moreover, it is assumed that first-time students are the most ignorant when it comes to various aspects relating to software licensing and intellectual property. In addition, in many institutions, third-year students are required to submit a final year project where they have to develop their own software systems. It was assumed that this final project would put pressure on students so much so that they would tend to use pirated software given the high standards required of them. However, the results showed that second-year students were the most common users of pirated software, followed by first-year students, and then by third-year students. This pattern may be explained by the fact that many students drop out during the course of their academic studies. The reasons for dropping out are many, including a lack of financial means to pay for further studies.

Question 3

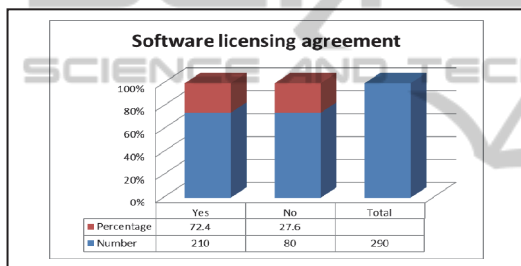


Figure 3: Software license agreement.

Question: Does the institution where you are enrolled provide you with software?

**Analysis:** This question was aimed at determining whether or not certain institutions that were aware of the availability of software systems for their students made these available free of charge. Providing software systems to students doing ICT-related courses sometimes falls under the umbrella of “corporate responsibility”. By engaging in such actions, organizations help alleviate the financial burden on students who, as a result, do not have to resort to using illegal software systems for their academic projects. In response to this question, it was found that nearly 200 students said that they received software systems from their respective institutions. This might be due to the fact that the problem is so common that the only way to cope with the demand of software systems is for the H.E institutions to provide the software themselves in order to limit software piracy.

Question 4

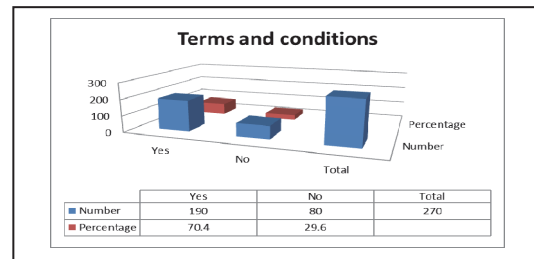


Figure 4: Software terms and conditions.

Question: Are you aware of the terms and conditions of using software systems?

**Analysis:** This question was primarily intended to assess whether or not students actually read the terms and conditions of the software system installed on their computer system. Very often the lack of understanding or ignorance may lead to non-compliance with the country’s rules and regulations. Before any law can be enforced, it is important to assess whether the law is well explained and understood. The answers to this question suggest that the majority do read the system’s terms and conditions. This can be explained by the fact that many are forced to read these terms and conditions in order to proceed with the installation. In fact the end-user needs to validate the condition window before proceeding further.

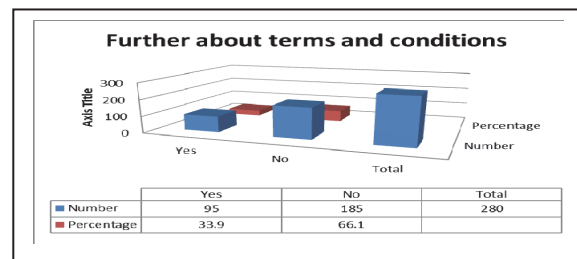


Figure 5: Terms and conditions understanding.

Question 5

Question: Do you understand the terms and conditions of your software system?

**Analysis:** This question was meant to examine whether after reading the terms and conditions, which the majority claimed to have read, they actually understood what they had read. Moreover, since most software systems need a positive validation of the terms and conditions in order for the user to be able to move to the next step of the installation, does this contribute in any way to the lack of understanding of the legal conditions? In the

previous question, most indicated that they did indeed read the terms and conditions, and thus the question needs to be asked whether they actually understand what they have read. The answers to this question indicate that the majority do not understand the meaning and importance of such texts. This result supports the previous assumption that many merely scroll through the terms and conditions in order to be able to install the system.

Question 6

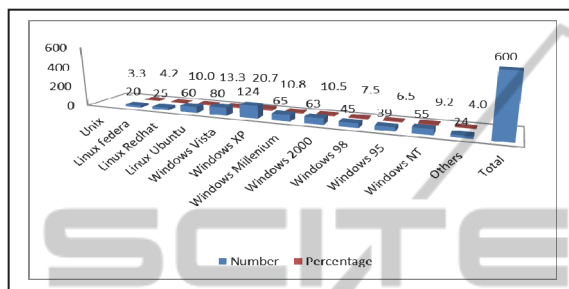


Figure 6: Types of operating system on private PCs.

Question: What types of operating systems are installed on your private computer?

**Analysis:** This question seeks to ascertain the number and types of operating systems installed on students' computer systems in order to understand whether there is a match with their institutions' systems as far as the operating system only is concerned. Knowing the types of operating system installed on students' computers will help to understand what sort of software needs they may have. This question thus indicates that XP is by far the most commonly used operating system which is a proprietary system and therefore requires licensing. Moreover, because of the type of platforms they are running, there will be some specific types of applications that can be supported; hence there should be a better understanding of the intellectual property rights.

Question 7

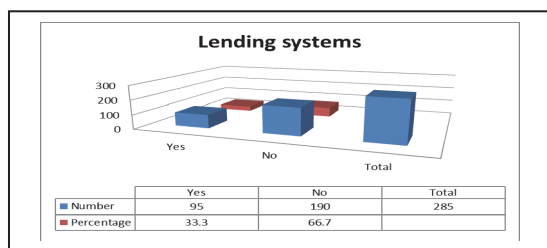


Figure 7: Lending software systems.

Question 7: Have you ever asked a friend, lecturer or ICT department to make you a copy of software (or installed it on your private computer system) you urgently needed for a school project and because you could not afford to legally acquire a copy of your own?

**Analysis:** This question brings up the fundamental issue of software piracy among students, especially from previously disadvantaged students. The cost of most software systems are beyond the reach of such students and this ultimately results in many of them using illegal systems. It is to be expected that when facing the issue of obtaining software that is out of reach as a result of financial constraints, students will ask help from their friends in order to complete a project. More than half of the participants admitted asking for a software copy from friends.

Question 8

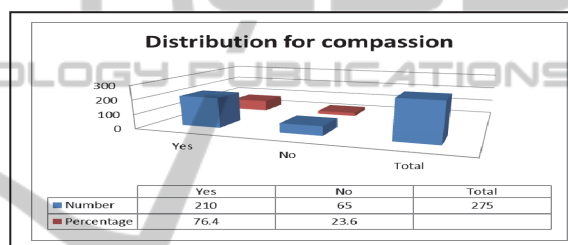


Figure 8: Software system distribution for compassion.

Question: During a class project you managed to legally obtain a copy of the software system needed for the project; you then realise that many of your classmates can't afford to access it, can you share the software system with them, install it on their system, or simply make duplicate copies so that they have their own copy?

**Analysis:** The answers to this question show that in many instances end-users of intellectual property are not aware of the crime they are committing by illegally making copies of the software systems they legally purchased. Moreover, in many communities, sharing with the less fortunate is embedded in their culture, and depriving others from what one abundantly has is seen as immoral. This view also impacts on the sharing of software systems, and many software system vendors will limit the usage of their product to a certain number of computers, end-users, or put a limit on the time during which it can be used. The answers to this question indicate that the majority of students are willing to make copies of software systems in order to help fellow students. The question thus arises whether they



actually are aware that by doing this, they are engaging in an illegal activity. This indicates how very often legally acquired software systems become illegal as people make copies not knowing that their legal software system was meant to be used on one computer system only.

Question 9

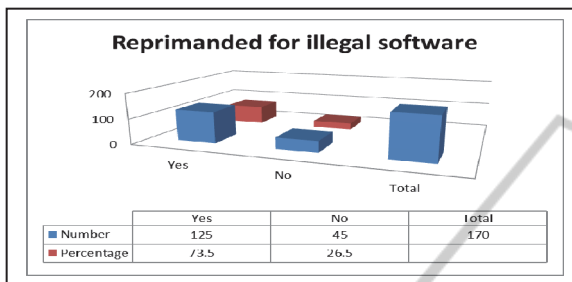


Figure 9: Reprimanded for using illegal software.

Question: Have you ever been reprimanded for using an illegal software system on your campus computer system?

**Analysis:** Many H.E institutions are well aware of the software licensing issue, and more specifically of the use of pirated software on their computer systems or on students' final year projects, which are used for evaluation. In many cases, there have been reprimands and students have been asked not to repeat this offence. This is an important step towards understanding the importance of intellectual property rights in H.E. It was found that more than half admitted to having been reprimanded after illegally making copies of a software system. This can be seen as a way of enforcing the rule of law to some degree; it also indicates the extent to which the problem seems to have escalated.

## 12 CONCLUSION

The literature shows the extent to which H.E institutions are facing the impact of software licensing costs, how this affects their operational needs, and how more financial assistance is needed to help alleviate this non-academic burden. Most countries in developing nations are capitalist economies, practicing a free market economy, which simply means that whenever someone invents, re-invents, innovates or discovers something new after investing substantial financial amounts into the project, they expect a return on investment. Thus, before anyone can gain access to the product, permission will have to be granted for the use of the

product, otherwise the use of the product is deemed unlawful and such infringements of the law will result into legal action. H.E institutions are seen as a mirror of society, are usually well respected, are known to have a high moral standing, and therefore should not be involved in any way in unlawful practices. This applies to both their staff and their students. Nonetheless, some of these unlawful activities are carried out without the knowledge or consent of the institution. Moreover, some of the students engaging with such activities are not well informed regarding the repercussions of their actions (see Questions 3, 4 and 5). They seem to be ignorant of the fact that making a copy of a software system without prior approval of the owner constitutes a crime. This paper has shown that many students are using illegally obtained proprietary software systems on their private computers (see Figure 6), and yet they ignore the conditions under which such software may be used. Figure 7 and Figure 9 indicate that the majority of students who participated in this research have at least been reprimanded for making illegal copies of software systems. It is important to note that the phenomenon of software piracy may have serious repercussions and can tarnish the image of any institution found supporting the illegal use of intellectual material such as software systems. Ideally, legal software systems should be distributed to all registered students free of charge, but budget issues may limit this ambition. Moreover, the high cost of Internet connectivity in most developing nations compels developers and vendors to distribute their products via CDs and DVDs, which are more likely to be copied. The theft of intellectual property is not acceptable in any nation, no matter how poor, yet it is understandable why end-users like disadvantaged students are tempted to obtain pirate copies. Software piracy can take many forms, and it should be noted that many students are not even aware that they are acting illegally, for instance when obtaining copies from friends. The only thing that may stop or prevent them from engaging in such illegal activities would be their moral and ethical values.

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