

Chapter 1 INTRODUCTION

1.1 Background of the Study

Vending has gone through significant changes. Many machines are evolving to accept credit cards and companies are now able to monitor a machine's state from afar. John Greenwick of the Greenway company is a former Mars Electronics employee and former product manager of the first ever bill acceptor. According to him, the industry saw a need for the ability to standardize the acceptance of coins and currency on a global basis. As such, a standard known as MDB (Multi-Drop Bus) was invented. This allows for machines around the world to utilize the same bill acceptor and coin changer devices with an international specification. In the area of service vending machines other innovations include internet kiosks and DVD vending. Cashless vending now allows consumers to use debit cards or precharged "keys" such as the U-Key for added convenience. Vending is a multi-billion dollar industry. [1]

When the laser printers were first made by Chester Carlson in the year 1938, no one liked these at first. It was only until Xerox Corporation agreed to have partnership with him that gave way for the release of Xerox printers in the United States. Johannes Gutenberg has always been the father of modern printing when he invested on the Gutenberg Press which came first before the release of Xerox machines. He also started the use of oil based ink which has



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been considered to be better than water based inks. This is the ancestor of the modern inkjet cartridges being used nowadays. Inkjet printers are very reasonably priced these days. Sure, for a big corporate printer you are shelling out a pretty penny, but for a simple machine that does the works, you should not have to spend over \$100. That is quite an improvement from just a decade ago. [2]

Printer ink cartridges are recyclable. Especially with the latest recycling laws in place, it is even easier to recycle your inkjet cartridges than ever before. You can send them into the Print Country Recycle Program, drop them off at your local supply store or wait for the waste round-up in your neighborhood. While laser printers are more expensive, their ink is cheaper than that of an inkjet printer. However, inkjet printers do not need to warm up before they print. It is all a balancing act, really. Inkjet cartridges also tend to be more expensive, but the initial investment is cheaper. Again, it all depends on your needs and what you can afford at the time of purchase. [3]

One thing to keep away from printed documents is water. Of course saturating paper in water is going to ruin it, but even a drop of water on an inkjet printed page can cause blurring of the ink.

The project's main objective is to help the students and professors not to go outside the campus to print important documents. Moreover with the use of the project, the printed files are protected during rainy days from getting wet.



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Lastly, it is more convenient because it is placed inside engineering building.

With the reasons stated, the proponents came up with the idea of developing a MCU-Based Coin Operated Printing Machine that greatly speeds up the process of printing the documents in instant.

1.2 Statement of the Problem

The project attempts to address the following problems:

- Does the machine provide a convenient means of printing documents?
- Does the proposed project prints documents accurately?
- Does the project save the user's time in printing documents?
- Is the proposed project's rate of performing task at a maximum speed?
- Is the machine user-friendly?

1.3 Significance of the Study

The proposed project is designed to print documents and provide a user friendly machine for the benefit and convenience of the users. The proponents intend to develop a system that is a practical complement to traditional process of printing paper works. The coin operated printing machine provides instant printing service inside the engineering building.

1.3.1 Educational Significance. The quest for knowledge is never ending. To that effect, the proponents like to contribute substantial information,



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and findings that may be helpful to readers and inquisitive developers; in any case, they may find it significant and reliable in their future studies.

1.3.2 Technological Significance. Modern technologies in the industry of machineries are most likely to change without ceasing. More innovative and more sophisticated designs are being developed to conform to the constantly changing needs of most people demanding for better technology. With that, the proponents intend to comply with these so called constant changes by providing a more robust machine than that of the existing system in providing greater service to people.

1.3.3 Economic Significance. Developing an instant printing machine entails less cost, as well for its implementation. And with this in mind, it would be beneficial to the users because it does not require a higher amount for the printing service.

1.4 Objectives of the Study

1.4.1 General Objective

The main objective of the project is to give an instant printing service by means of creating a coin operated printing machine.



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1.4.2 Specific Objectives

- To create a project that helps the students and professors not to go outside the campus when they intend to print documents.
- To keep the printed files protected during rainy days from getting wet.
- To give good quality of printed materials for the users with a reasonable price.
- To maintain the computer safe and away from viruses.
- To make sure that the user's device is protected against viruses.
- To create a user friendly printing system.

1.5 Scope and Delimitations

The scope and delimitations are what your study is going to tackle and what will its limitations be.

1.5.1 Scope

- It can be used during school hours. It depends on the place where it is installed.
- The target users are the students or professors whose intend to print some documents.



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- The system focuses on the use of machine that can dispense printed materials.
- The system prints colored and black and white paper works. The paper size maybe short or long.
- The printing service will be charged two pesos per page.
- For every one peso coin, the computer maybe accessed for three minutes.
- The system can import the files through flash-disk or internet.
- The computer system contains an anti-virus and deep-freezes program security system for the flash-disk of the user.
- The system has an auto shutdown for every ten minutes, if the computer mouse and keyboard is inactive.

1.5.2 Delimitations

- Only one peso coins are used, other coins and bills will not be allowed.
- It does not provide change. Excess money is forfeited. It is strongly recommended that payments should be in exact amount.
- The project is not fully maintenance free. Once the ink or paper becomes empty it requires manual filling. The user needs to provide their own paper.
- The system does not have security system installed. Therefore users should not leave their flash-disks unattended or must not forget to log out their e-mail accounts if they are accessing the Printing Machine.



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- The system only read and prints the files that are compatible with Microsoft office 2007 and PDF files.
- Once the system accidentally shuts down, all the imported files will be automatically erased and the coin slot accumulator will be reset.
- For every session, the maximum number of pages allowed to be printed is 10 copies.

1.6 Definition of Terms:

Aluminum

An abundant metallic chemical element which is widely used throughout the world for a wide range of products. Use for the housing or casing.

Automation

Replacing manual operations with computer procedures. For example, office automation refers to replacing typewriters, filing cabinets and paper appointment books with computer applications. Factory automation refers to computer-driven assembly lines as well as replacing humans with robots.

Circuit Breaker

An automatically operated electrical switch designed to protect an electrical



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circuit from damage caused by overload or short circuit.

Coin

Is a piece of hard material that is standardized in weight, is produced in large quantities in order to facilitate trade, and primarily can be used as a legal tender token for commerce in the designated country, region, or territory.

Coin slot

A coin receptacle on a vending machine.

Flow Chart

Is a type of diagram that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting these with arrows.

Hardware

Is a general term for equipment such as keys, locks, hinges, latches, handles, wire chains, plumbing supplies, tools, utensils, cutlery and machine parts. Household hardware is typically sold in hardware stores.



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Ink

Is liquid or paste that contains pigments and/or dyes and is used to color a surface to produce an image, text, or design. Ink is used for drawing and/or writing with a pen, brush, or quill.

Integrated Circuit (IC)

Is an electronic circuit manufactured by the patterned diffusion of trace elements into the surface of a thin substrate of semiconductor material.

Keypad

Is a set of buttons arranged in a block or "pad" which usually bear digits, symbols and usually a complete set of alphabetical letters.

Liquid Crystal Display (LCD)

Is a flat panel display, electronic visual display, video display that uses the light modulating properties of liquid crystals (LCs). LCs does not emit light directly.

Memory

Refers to the physical devices used to store programs (sequences of instructions) or data (e.g. program state information) on a temporary or



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permanent basis for use in a computer or other digital electronic device.

Photoelectric Sensor

Is a device used to detect the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver. They are used extensively in industrial manufacturing.

Power Cord

Is a cable that temporarily connects an appliance to the mains electricity supply via a wall socket or extension cord.

Power Supply

Is a device that supplies electrical energy to one or more electric loads. The term is most commonly applied to devices that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy (e.g., mechanical, chemical, solar) to electrical energy.



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Printer

Is used to print anything that you want, like pictures or documents or data. They plug in where there is a USB slot, from there you can click print and the document is sent to the port where your document is printed.

Program

A set of coded instructions that a computer can understand to solve a problem or produce a desired result. Two basic types of computer programs are an operating system, which provides the most fundamental instructions a computer uses in its operations.

Prototype

An original model on which something is patterned.

Relay Driver

Is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v main supply.

Solid State Relay

Is an electronic switching device in which a small control signal controls a



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larger load current or voltage. It comprises a voltage or current sensor which responds to an appropriate input (control signal), a solid-state electronic switching device of some kind which switches power to the load circuitry either on or off, and some coupling mechanism to enable the control signal to activate this switch without mechanical parts.

Stepper Motor

Is a brushless, electric motor that can divide a full rotation into a large number of steps.

Switch

Is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another.

Universal Serial Bus (USB)

is a set of connectivity specifications developed in collaboration with industry leaders. Originally released in 1995 at just 12 megabits per second (Mbps),



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USB allows easy, high-speed connections of peripherals to Personal Computer that, once plugged in, configure automatically.

USB Flash Drive

Is a data storage device that consists of flash memory with an integrated Universal Serial Bus (USB) interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk.

USB Hub

Is a device that expands a single USB port into several so that there are more ports available to connect devices to a host system.

Vending Machine

Is a machine which dispenses items such as snacks, beverages, alcohol, cigarettes, lottery tickets, consumer products and even gold and gems to customers automatically, after the customer inserts currency or credit into the machine.

Chapter 2

REVIEW OF RELATED STUDIES AND LITERATURE

This chapter discusses the conceptual framework of the study, related literature and studies that helped in further understanding this study. It also contains some technical terms that are used from the researches that the proponents has encountered while this study is conducted. This serves as a guide for the readers to understand some concepts regarding the project. Facts and data were gathered by the proponents from different books, journals, magazines, websites and unpublished theses which provide significant ideas, insights and probable answers to the problem of the design project.

2.1 History of Computer Printer

In 1953, the first high-speed printer was developed by Remington-Rand for use on the Univac computer. In 1938, Chester Carlson invented a dry printing process called electro photography commonly called a Xerox, the foundation technology for laser printers to come. [4]



Figure 2.1: Universal Automatic Computer (UNIVAC)

The original laser printer called EARS was developed at the Xerox Palo Alto Research Center (PARC) beginning in 1969 and completed in November, 1971. Xerox Engineer, Gary Starkweather adapted Xerox copier technology adding a laser beam to it to come up with the laser printer. According to Xerox, The Xerox 9700 Electronic Printing System, the first xerographic laser printer product, was released in 1977. The 9700, a direct descendent from the original PARC "EARS" printer which pioneered in laser scanning optics, character generation electronics, and page-formatting software, was the first product on the market to be enabled by PARC research. According to IBM (International Business Machine) Company, the very first IBM 3800 was installed in the central accounting office at F. W. Woolworth's North American data center in Milwaukee, Wisconsin in 1976. The IBM 3800 Printing System was the industry's first high-speed, laser printer. A laser printer that operated at speeds of more than 100 impressions-per-minute. It was the first printer to combine laser technology and electro photography according to IBM. In 1992, Hewlett-Packard released the



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popular LaserJet 4, the first 600 by 600 dots per inch resolution laser printer. In 1976, the inkjet printer was invented, but it took until 1988 for the inkjet to become a home consumer item with Hewlett-Packard's release of the DeskJet inkjet printer, priced at a whopping \$1000[4].

In this article, the proponents showed how the printing or printer industry has evolved. It helped the proponents to choose what are the appropriate specs of the printer to be use in the project. Also in knowing the history of printing industry the proponents get some idea of developing it into more well-situated for the costumer.

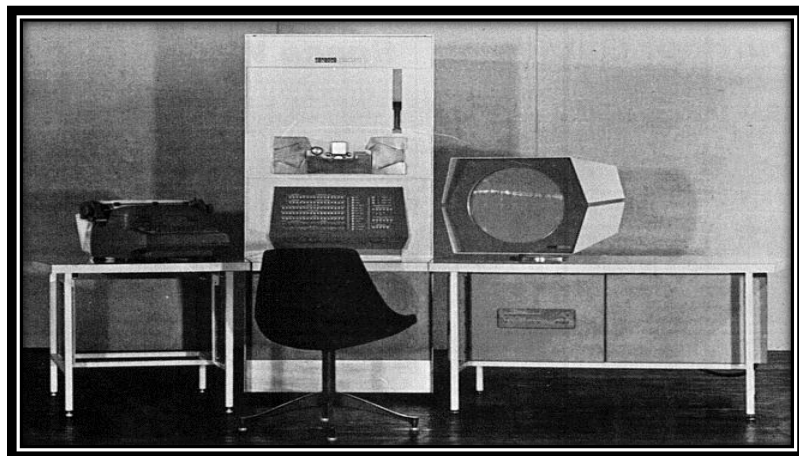


Figure 2.2: First Computer Printer



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2.2 Desktop Printing

In computing, a printer is a peripheral which produces a hard copy (permanent readable text and/or graphics) of documents stored in electronic form, usually on physical print media such as paper or transparencies. Many printers are primarily used as local peripherals, and are attached by a printer cable or, in most new printers, a USB cable to a computer which serves as a document source. Some printers, commonly known as network printers, have built-in network interfaces (typically wireless and/or Ethernet), and can serve as a hardcopy device for any user on the network. Individual printers are often designed to support both local and network connected users at the same time. In addition, a few modern printers can directly interface to electronic media such as memory sticks or memory cards, or to image capture devices such as digital cameras, scanners; some printers are combined with a scanners and/or fax machines in a single unit, and can function as photocopiers. Printers that include non-printing features are sometimes called Multifunction printers (MFP), Multi-Function Devices (MFD), or All-In-One (AIO) printers. Most MFPs include printing, scanning, and copying among their features [5].

In this article, it shows that printing services can be very successful because of the USB technology used as documentation source. The USB or flash disk is very common tool today as storage for data or files. The proponents chose the kind of printer that best suits for the design project and with a great contribution for the operation of the system.



Figure 2.3: All-In-One Printer

2.3 Why Printer Ink Is So Expensive

Kudos to Anne Kadet over at Smart Money. Her latest article about printer ink cartridges titled "Why Printer Ink Is So Expensive" is one of the best analysis we've seen in a long time. Ms. Kadet rightly points out that: average retail price of a milliliter of ink shot up 360 percent between 1999 and 2007. Meanwhile, a \$30 ink cartridge costs just three bucks to make; suppliers could cut prices in half and still take in a nice profit. Even while printer makers lose about \$30 on every \$100 printer sale, the typical customer spends more than three times as much on ink over a three-year period as he did on the printer. Often, the cheapest models require the most expensive ink. Strange quirk in the law that makes it almost impossible to compare long-term ink costs. The 1966 Fair Packaging and Labeling Act, which requires manufacturers to state quantities on consumer packaging, allows just a few exceptions, including lighters, safety pins and you



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guessed it ink. Only one of the major makers, HP, offers page yield information on its cartridge packaging, and you still have to calculate per-page costs. According to American Consumer Institute President Steve Pociask, Consumers do not have the right information to make the right choice, who studies the ink market [6].

In this article the discussion focuses on how much the cost of printer cartridge. This article helped the proponents to choose what type of cartridge will be use for more profitable services.

2.4 The Early Vending Machines

It is very surprising that the world's first drink vending machine was invented by Hero of Alexandria around AD 50, that is, nearly 2000 years ago. Though the description of the invention has been found in an ancient text of his called The Pneumatica , the actual invention has yet to be discovered. This idea was of dispensing some quantity of Holy Water when a coin was placed in a slot on a machine. The coin dropped on to a pan on a lever and the weight of the coin moved the lever which opened a crude valve and allowed the Holy Water to flow. As the lever continued to move, the coin fell off. The lever moved back and the water flow was shut off again.

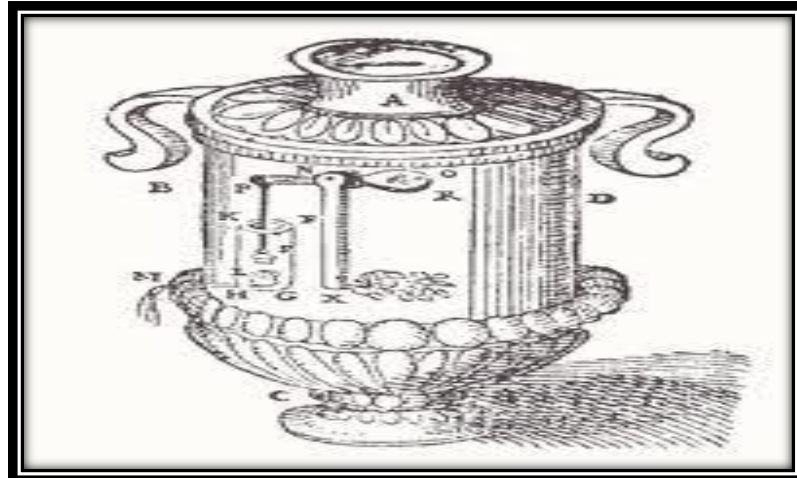


Figure 2.4: The First Vending Machine

After this, it was in the 1880s that the vending machine became a commercial success. The first machines vending postcards and books appeared in London. Coffee and drinks vending machines are now a common sight in offices and hospitals.[7]



Figure 2.5: Popular Vending Machine

The development of machines has also led to more choice between machines. All this depends on who exactly will be using the machine that is where is the machine located? If it is located near a school or a college, then



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children and teenagers will be using the vending machine which means they will be more inclined to drink fruit juices and cold drinks. A snacks and can vending machine will also be successful in such a location. There are so many drinks which come packed in cans today. While hot coffee and tea will not be a popular option with children and teenagers, cold coffee and cold tea, coming packed in cans are a very popular option along with fruit juices and drinks. And why just children and teenagers? These are popular amongst people of any age group. If you are in an office with a reasonable number of employees and also have guests consistently, then you can buy a big snack and can vending machine which can serve hundreds of customers on a single fill. Many reputed suppliers keep a stock of such snacks and can vending machines. In fact, a brief search on the internet will open up many more options. You can get all the necessary details about the machine and the supplier also. A good supplier having drinks vending machine or a can vending machine will also provide you with the necessary maintenance and also provide customer support 24 x 7. [7].

In this first part of article it mentions the very first vending machine of the Hero of Alexandria, the machine use coin as payment. The proponents also use this method because it is simple and considered the price of the payment which is at low price. Based from this article, the right location of vending machine is the key to success for profitable outcome. It helped the proponents to pick a right area and use tips in maintenance of vending machine. The proponents use this as guideline in building this project.



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2.5 Hi-tech Vending Machine

Vending machines used to just swallow your money. Now they sell anything from drinks to live crabs and can even offer a lifeline in disaster hit countries.

In the early 1990s, environmental campaigners in Japan used to highlight the fact that the nation's 3.6m vending machines collectively used electricity equal to the output of one nuclear power station. Such a comparison holds extra poignancy today, of course, especially when you consider there are now twice the numbers of vending machines in the country that famously just can't get enough of them. In fact, with the country experiencing rolling blackouts following the earthquake on 11 March, a grassroots campaign was launched to persuade Coca-Cola to switch off its 980,000 vending machines to help conserve energy. An executive from another drinks firm was quick to retaliate: But vending machines constitute a lifeline for residents.

Are vending machines now such an essential component of our instant-fix, consumer lifestyles that we can't do without them, even in an emergency? According to Jonathan Hilder chief executive of the Automatic Vending Association, There is one vending machine for every 23 people in Japan. They are the biggest vending market in the world and there is a machine on every street corner selling anything from drinks and live crabs to music and underwear.



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In the UK, there is a vending machine for every 55 people. But expect vending machines to get ever-more commonplace as they get ever-more sophisticated.

Vending has come a long way since the ancient Greeks relied on Hero's coin-operated machine to dispense holy water at temples. The first machines appeared in the UK during the late Victorian era, selling postcards before moving on to the ubiquitous machines we see today selling items such as chocolate bars, stamps and cigarettes that are found in railway stations and other busy public places.

The thing that defines these vending machines is their crude, mechanical simplicity and invariable reluctance despite often receiving a Fonz like whack from the frustrated purchaser's clenched fist to accept coins without rejecting at least a third of them. (The introduction of new 5p and 10p coins by the Royal Mint was recently delayed until next year after lobbying by the vending industry saying it would cost £17m to recalibrate all its machines.)

According to Hilder, the common perception that vending machines do not accept most coins is now largely false. The technology has come on enormously in recent years, According to Hilder, and don't blame it all on the industry: 2.8% of £1 coins are forgeries. More than seven billion products are vended in the UK each year. The machines offer superb convenience in an age when we crave convenience.



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The staples will always be popular, but vending is undergoing a revolution in terms of the range of items machines offer, as well as how they are operated. For example, hot drinks are the most popular vended item in the UK today, with 60% of vending machines now found in the workplace. According to Hilder, It's not so much that you can get a hot drink now that's been the case for years but the variety on offer is fast increasing. In the past five years, there's been a boom in larger drink sizes, with 9oz and even 12oz cups becoming the norm. And rather than rely on instant coffee, some machines are even grinding their own coffee beans.

According to Hilder, Most new vending machines now are touch screen, giving users a wealth of information and options. And once a universal wave pay system is adopted which will be about five to 10 years away the options will be incredible for what can be vended. But until that day arrives, food and drink will continue to dominate vending. Earlier this month, Coca-Cola revealed a new drinks vending machine it claimed had been in development for six years. Called the Freestyle, the touch-screen machine offers up to 106 varieties of beverage. At its launch in Atlanta, the company's director of marketing offered some bold claims for the machine: To our knowledge there is nothing like this in the world. This is the future of fountain dispensing. [8]

According to the article entitled the rise of the Hi-Tech vending machine, the vending machine is very threading technology. The development of this very in demand. The vending machine can sell drinks to live crabs. The point of the

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proposed project is to give most useful and very high demand vending machine in the campus. The proposed project considers all things that give instant printing services without the need of going out the campus which will be beneficial to the costumer. The article helped the proponents to have endless ideas in developing the proposed project and to high-end industry of vending machine.



Figure 2.6: Tokyo's Vending Machines



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2.6 Faronics Deep-Freeze

The situation of San Juan Unified is a K-12 school district with 45,000 students over 74 sites. District wide there are over 12,000 workstations and 80 central servers; 8,000 of those are Macintosh computers running OS 9 and OS X. The remaining 4,000 machines are HP and Compaqs running Windows 2000 and XP. The servers primarily run Windows 2003 Server, but there are some Windows 2000 and OS X platforms as well. The problem is The Windows workstations at San Juan Unified suffered from virtually constant software issues that rendered computers unusable on a daily basis, and those computers were often left unrepaired for up to six weeks, due to lack of maintenance manpower. According to Chuck Taylor, a Microcomputer Specialist at San Juan Unified, their biggest problems occurred in minimally supervised areas. For example, students were often left unsupervised on library computers and kids would purposely trash the operating systems. Other kids, who meant no harm, caused damage by going to their favorite web sites and unintentionally inviting spyware, malware, worms, and other harmful programs into the system. With only six technicians responsible for the troubleshooting, repair, and management of 12,000 computers, it is no wonder that the school district experienced large amounts of downtime. Spent countless hours cleaning viruses and malware from Microsoft computers, but no sooner would we get one computer fixed and two more were called in for repair.



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The Solution In their preventative efforts, the IT staff implemented pop-up blocker software for Windows Explorer by installing the Google Toolbar, and gave their end users more control over cleaning their own spyware by installing and configuring Spybot. They also installed CA Trust Pest Patrol on helpdesk computers so the department could remotely clean issues on site computers. But they were still looking for something to solve these security and downtime problems. It was at a CETPA tradeshow that Mr. Taylor first heard about a product from Faronics Technologies called Deep Freeze. But because of the financial challenges in the K-12 public school system, it took three years to convince the department to even consider the purchase. Only when spyware was at an all time high and work orders were taking longer to get to do the department decide to purchase 250 licenses for evaluation. The evaluation was conducted on 250 computers over several library sites using Deep Freeze Enterprise. The department set up a central server to monitor the Deep Freeze computers from several remote Deep Freeze consoles. Some of the concerns the department had included performing Windows and antivirus definition updates, as well as the general robustness of the consoles because the district WAN covered 72 square miles. Some sites have T1 lines, while a few have faster DS-3 lines coming in and out. Controlling all the remote computers was very important. The more we learn about Deep Freeze, the better the product gets. Faronics has been excellent with documentation, technical white papers, and the development of free configuration tools. Mr. Taylor reports that the day-to-day operation of lab computers is now reliable. Mr. Taylor said I have had teachers



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near retirement tell me they were ready to call it quits because of erratic and inconsistent computer software. Not until after last summer when Deep Freeze was installed did they finally remember why they liked to teach. Computer issues sometimes used as much as 20 minutes of a teacher's 45 minute period before Deep Freeze was deployed. And re-imaging because of software problems is a thing of the past. Every summer for the past 10 years, we have re-imaged every business lab in preparation for the coming year. Typically, we did not finish our last lab until after the new school year had started. Because of Deep Freeze, for the first time in 10 years, we didn't need to re-image those labs this past summer.

[9]

The article and the proponents have same idea of eliminating the viruses that can get trough internet or from the different users that use the computer. The proponent implement deep-freeze to secure the users flask disk and to maintain the proper configuration of the computer. It is very convenient for the users and for the proponents.



Figure 2.7: Logo of Faronics Deep-Freeze



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Chapter 3

MATERIALS AND METHODS

The factors that push the proponents to be inquisitive are very important in the process of research. Proponents should be determined to observe, search and continue what they have started. This chapter represents the method of research that have been utilized in developing the proposed system. Methods of research used, data gathering instruments, analytical tools, methods for product evaluation as well as technical, operational and economic feasibility information are also featured in this section.

3.1 Methods of Research

In order to achieve understanding of all activities required to develop and design this system, the proponents used various research methods and data gathering instruments.

3.1.1 Library Research Method

It is the most common method that the proponents used. This method is applied in order to gain information and ideas from other references such as books, published materials and unpublished thesis. This method was also used to get ideas to be written in the related literature and on the conducted study.



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3.1.2 Creative Research Method

This type of research employs basically a stylistic approach and analysis of human experience. It utilizes the creativity and sense of originality of the proponents so that they can broaden the scope of the proposed system.

3.1.3 Prognostic Research Method

This method refers to any scientific investigations in which the main and stated purpose is to predict the future operation of factors investigated. This method helped the proponents know the economic and technical feasibility of the proposed system. Considering that automation will be implemented in the future state of our construction firms.

3.2 Data Gathering Instruments

These data gathering instrument are used in this study to obtain useful information that would help the proponents in creating the proposed design project. Most of information we gathered came from data, through internet and reading materials. The proponents also used observation and evaluation as tools.

3.2.1 Observation

An instrument used to evaluate and verify the facts gathered by the proponents. The proponents were able to identify the problems in going outside



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of the campus whenever they indeed to print some documents thus urges us in designing this project. Observations are usually done in conjunction with another data gathering method that is used to fill in the gaps and answer questions.

3.2.3 Questionnaire

The use of questionnaire is another way to gather information about the system. Students are to be asked by means of questionnaire designed to promulgate the intentions of the project.

Criteria:

Efficiency – the capability to produce the desired output with minimum effort on the part of the user

Accuracy – the ability to produce desired output without error

Reliability – the ability of the system to performed the required function and could be easily accessed by the user

Usefulness – the ability of the system to print documents

User Friendliness – the characteristic of the system to be easily understood and used by the user

3.3 Conceptual Frameworks

With the fast growing of technologies and growing needs of the society, proponents' prime objective is to create a machine that would lighten the works and would benefit the society. For this reason the proponents conceptualize a design project regarding the interest in automation of devices which leads us to the creation of an MCU-Based: Coin Operated Printing Machine that would give instant printing service.

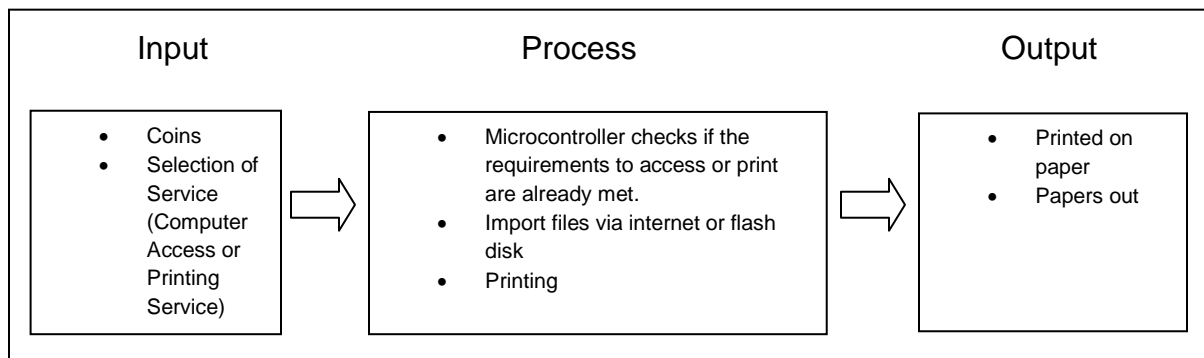


Figure 3.1 Conceptual Framework

In the design project, the proponents choose the coin as the medium. The system displays if the service is either computer access or printing service. If computer access will be the needed service, one peso coin will be inserted and the system gives three minutes of computer service. If printing service is chosen, the system asks to input number of copies and microcontroller will require certain conditions on how many coins should be imputed. After the coin is inserted in the coin acceptor, the computer monitor, mouse and keyboard turn on and for every coin inserted the time to access the system will increase. The system



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allows you to browse your flash-drive or download from the internet so that you can choose which document you want to print. The photoelectric sensor will detect the paper out. Every time the sensor detects that a paper is out, the microcontroller deaccumulates the countdown until it reaches zero. When that happens, the printer automatically shuts down.

3.3.1 Computer Access or Printing Service

The user select if the system is to be use as a computer or a printer. The printer, LCD monitor, mouse and keyboard is initially off. If the users choose the computer access and inserted at least one peso coin. The computer monitor, mouse and the keyboard automatically turn on for three minutes. If the users select the printing service and input how many copies to be print. It will display how much the price and once the certain condition is fulfilled the printer automatically turn on. The computer monitor, mouse and the keyboard will automatically shutdown once the countdown timer reaches the zero. The computer printer will automatically shutdown after finish printing the files.

3.3.2 Standby Mode and Inactive Mode

The LCD monitor, mouse, keyboard and computer printer is initially off so no one can use the printing system and automatically resumes the power if the user inserts a coin. If the computer is idle, where the mouse and keyboard is totally inactive in ten minutes. The computer CPU is automatically shutdown.



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3.3.3 Importing Files

In printing some documents the system required a file to print. The system can import the files through flash disk or via internet. The system is free from virus because it is having an anti-virus application like avast-pro anti-virus, faronics deep-freeze and usb-security. All the files imported or downloaded will automatically vanish once the computer is rebooted.

3.4 Statistical Tools

Mean. It is one of the simplest and most efficient measures of central tendency. (Montana & Pagoso, 2002)

Formula:

$$M = \frac{\{(5n) + (4n) + (3n) + (2n) + (1n)\}}{N}$$

Equation 3.1. Mean Formula

Where: M= is the average number of respondents.

N= Total number of respondents

n= refers to the sample size or total number of respondents.

Likert Scale. Likert Scale is made up of a series of opinion statements about some issue when individuals are presented with a list of statements about a single topic and are instructed to respond to each statement in terms of their agreement or disagreement. The proponents used this device to determine the



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magnitude of the responses of the respondents and applied the results.

(Montana & Pagoso, 2002)

Scale	Rate	Interpretation
5	5.00 - 4.50	Excellent
4	4.49 - 3.50	Very Satisfactory
3	3.49 - 2.50	Satisfactory
2	2.49 - 1.50	Fair
1	1.49 - 1.00	Poor

Table 3.1: Likert Scale



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3.5 Billing of Materials

Quantity	Material	Unit Price (PHP)	Amount (PHP)
1	Casing	6000	6000
1	Photo Electric Sensor	4960	4960
2	Solid State Relay (AC)	2280	4560
1	LCD Display (20x4)	2600	2600
1	LCD Monitor	3500	3500
1	Coin Slot	2500	2500
1	Printer	2400	2400
1	Keypad	1700	1700
1	Power Supply	1600	1600
1	Ink	1250	1250
3	Relay Driver	160	480
1	Circuit Breaker	350	350
1	PIC16F877	320	320
1	USB Hub	280	280
1	USB Network Adapter	280	280
1	USB Keyboard	250	250
1	USB Mouse	150	150
TOTAL:			PHP 33,180

Table 3.2: Billing of Materials



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3.6 Material Specifications

3.6.1 Circuit Breaker

Slot	4x220 volts
Power	500watts
Protection	Short circuit and overload protection
Casing	Metal coated

Table 3.3 Circuit Breaker Specifications

3.6.2 Coin slot

An electronic device where coins are inserted to trigger and activate other devices. It requires 12v input voltage.

Features:

- Suitable all coins diameter and thickness and materials.
- Timer switch function for adjustable.
- Anti-stringing to protect machine.
- Counter available
- CPU control alarm and cyclical lockout (HI-07CS)
- CPU control LED that to execute state and cyclical lockout (S-071CS)



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3.6.3 Central Processing Unit (CPU)

Operating System	Microsoft Windows XP Professional
Language	English
System Manufacturer	Samsung Electronics Co., LTD
System Model	Desktop system
Processor	Intel(R) Pentium(R) 4 CPU 1.80GHz
Memory	254MB RAM
Direct C Version	DirectX 9.0c

Table 3.4 CPU Specifications

3.6.4 Dot Matrix Liquid Crystal Display Controller/Driver

The HD44780U character generator ROM is extended to generate 208 5 x 8 dot characters fonts and 35 5 x 10 dot character fonts for a total of 240 different character fonts. The low supply (2.7V to 5.5V) of the HD44780U is suitable for any portable battery-driven product requiring low power dissipation.

Features:

- 5 x 8 and 5 x 10 dot matrix possible
- Low power operation support: 2.7 to 5v5V
- Wide range of liquid crystal display driver power: 3 to 11v
- Liquid crystal display waveform; one line frequency AC waveform
- Correspond to high speed MPU bus interface: 2MHz (when VCC = 5V)



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- 4-bit or 8-bit display RAM (80 characters max)
- 9920-bit character generator ROM for total of 240 character fonts: 208 and 32 character fonts
- 64 x 8-bit character generator RAM: 8 characters font and 4 characters font.

3.6.5 Keypad

The keypad requires only 4 wires to operate: +VDC, GND, TX, RX.

Remove the top half of the unit by removing the 6 screws around the outer edge and attach the 4 wires to the terminal strip as indicated by the label.

Input Voltage	+9 to 20 VDC
Input Current	300 mA (max)

Table 3.5 Keypad Specifications

3.6.6 LCD Monitor: Samsung 15" LCD Monitor

Specifications:

Manufacturer:	Samsung
Part Number:	152B Silver
Display Type	TFT active matrix
Diagonal Size	15 in
Viewable Size	15 in
Aspect Ratio	4:3



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Native Resolution	1024 x 768 at 75 Hz
Pixel Pitch	0.3 mm
Brightness	350 cd/m2
Image Contrast Ratio	450:1
Color Support	16.7 million colors
Response Time	25 ms
Vertical Refresh Rate	75 Hz
Horizontal Refresh Rate	61 kHz
Video Bandwidth	80 MHz
Factory Preset Resolution Modes	640 x 350 / 70 Hz, 640 x 480 / 60 Hz, 720 x 400 / 70 Hz, 640 x 480 / 75 Hz, 640 x 480 / 72 Hz, 800 x 600 / 56 Hz, 800 x 600 / 60 Hz, 800 x 600 / 75 Hz, 800 x 600 / 72 Hz, 1024 x 768 / 60 Hz, 1024 x 768 / 70 Hz, 1024 x 768 / 75 Hz
Horizontal Viewing Angle	+80 / -80

Vertical Viewing Angle	+70 / -80
Controls & Adjustments	Color temperature, Color balance, H/V position, Brightness, Contrast
OSD Languages	Japanese
Dimensions (WxDxH)	14.1 in x 7.3 in x 13.7 in
Interfaces	1 x VGA - 15 pin HD D-Sub (HD-15)
Flat Panel Mount Interface	75 x 75 mm
Form Factor	External
Voltage Required	AC 120/230 V (50/60 Hz)
Power Consumption Operational	31 Watts
Power Consumption Standby / Sleep	2 Watt

Table 3.6 LCD Monitor Specifications

3.6.7 Photoelectric switch

Switches used mainly for situations such as sentry devices or outside lights. The generation of electricity by the photovoltaic cell when light is present.

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Sensing Method	Through-beam
Light source (wavelength)	Red LED (660nm)
Power supply voltage	12 to 24 VDC \pm 10%, ripple (p-p): 10% max.
Current consumption	40 mA max.
Sensing distance	Groove width of 5 mm
Response time	Operate or reset: 0.5 ms max.
Case	PBT (polybutylene terephthalate)
Lens	Acrylics

Table 3.7 Photoelectric Switch Specifications

3.6.8 PIC16F877

High-performance RISC CPU:

- Lead-free:RoHS-compliant
- Operating speed:20Mhz, 200ns instruction cycle
- Operating voltage:4.0-5.5volts
- Industrial temperature range(-40 to +85 degrees)
- 15 Interrupt sources
- 35 single word instructions
- All single-cycle instructions except for program branches

Special Microcontroller Features:

- Flash memory:14.3KB(8192 words)
- Data SRAM:368 bytes
- Data EEPROM:256 bytes
- Self-reprogrammable under software control
- In-circuit serial programming via two pins
- Watchdog timer with on-chip RC oscillator



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- Programmable code protection
- Power-saving code protection
- Selectable oscillator options
- In-circuit debug via two pins

Peripheral Features:

- 33 I/O pins : 5 I/O ports
- Timer0:8-bit timer/counter with 8-bit prescaler
- Timer1:16-bit timer/counter with prescaler
- Timer2:8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Two capture, compare, PWM modules
- Synchronous serial port with two modes
- USART/SCI with 9-bit address detection
- Parallel slave port
- Brown-out detection circuitry for brown-out reset

3.6.9 Power Supply

Specifications:

Output	Three
Output Power	220W
Low Ripple	Full loading 50mV
Mechanical Dimension	(L*W*H): 184*130*54 mm
Carton Dimension	(L*W*H): 410*400*295 mm
Weight	680g

Table 3.8 Power Supply Specifications



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3.6.10 Printer: Canon PIXMA ip2770

The latest series of Canon printers that have been using hybrid ink system. Three-color ink cartridge is packed with a single mold so that yielding sharper color. Black ink to create a text printed with a print speed of 7.0 ipm printers images per minute while for colored ink with a print speed of 4.8 ipm for color sharper.

Full specifications:

- Resolution (dpi)*2 4800 x 1200dpi (max.)
- Min. Ink Droplet Size 2pl
- Number of Nozzles 1472
- Cartridge Type PG-810, CL-811 (PG-810XL, CL811XL Optional)
- Printable Width Up to 203.2mm (8-inch)
- Borderless: Up to 216mm (8.5-inch)
- Recommended Printing Area Top margin: 31.2mm
- Bottom margin: 32.5mm
- Applicable Media Sizes A4, Letter, Legal, A5, B5, Envelopes (DL, COM10), 4 x 6", 5 x 7", 8 x 10"
- Borderless Photo 4 x 6" / 8 x 10" / A4
- Windows 2000 SP4, XP SP2 / SP3, Vista SP1 / SP2
- Macintosh OS X 10.4.11 - 10.6
- Interface USB 2.0 Hi-Speed Canon Bundled Software



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- Power AC100 - 240V, 50 / 60Hz
- Weight 3.4kg
- Dimension (W x D x H) 445 x 250 x 130mm

3.6.11 Relay Driver

A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v mains supply.

2x330 ohm Resistor
1x4.7k ohm Resistor
Relay 12V
1N4001
LED

Table 3.9 Relay Driver Specifications

3.6.12 Solenoid State Relay

A solenoid valve is an electromechanical valve for use with liquid or gas. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports.

Features:

- Input: 3-32VDC
- Model: SSR-10DA
- Load: 24-480VAC



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3.6.13 USB Hub: CD-R King Octopus 7-Port USB Hub

Features:

- Adds seven 2.0 USB high-speed ports.
- Fully compliant with USB 2.0 and 1.1 specification.
- Supports data transfer rate up to 480Mbps.
- Individual port over current protection.
- Ergonomic design
- Provides up to 500mA to each port.
- Hot swappable, Plug and Play.
- Supports Windows 7/Vista/XP/2000/ME/98 and Mac OS

3.6.14 Wi-Fi Receiver: CD-R King Wireless-N USB Network Adapter

Features:

- 802. 11b: 1,2,5,5 11Mbps
- 802. 11g: 6,9,12,18,24,36,48 54Mbps
- 802. 11n: (20MHz) MCS0-7, Support up to 72Mbps (40MHz)
MCS0-7, Support up to 150 Mbps.
- OFDM, peak rate 150 Mbps, Peak throughput 90Mbps.
- Security support for 64/128 WEP, WPA, WPA2, TKIP, AES.
- Operates in 2.4GHz frequency bands. Power Management.

Chapter 4

RESULTS AND DISCUSSION

The interpreted results of the design project's evaluation are carefully being discussed in this chapter. The proponent discusses the summarized result of the survey and finished output of the design project.

4.1 Presentation of the Results

The graphs represented herein show the results from the analysis phase of the proposed project. The result of the evaluation of the respondents to the proposed project is also shown.

The criteria for the survey are developed based on the objectives of the project. The proponents came up with the criteria of testing the efficiency, accuracy, reliability, usefulness and user friendliness of the project. These criteria would help the proponents determine if the system achieved its objective.

Criteria	5	4	3	2	1	Total	Mean	Interpretation
Efficiency	8	9	3	0	0	20	4.25	Very Satisfactory
Accuracy	8	9	3	0	0	20	4.25	Very Satisfactory
Reliability	9	10	1	0	0	20	4.4	Very Satisfactory
Usefulness	11	7	2	0	0	20	4.45	Very Satisfactory
User friendliness	11	6	3	0	0	20	4.65	Excellent

Table 4.1 Respondent's rating to the project



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The Table 4.1 shows the number as a result from the evaluation and then computed according to the statistical tools used. Given by 20 respondents the proponents computed the mean value for each corresponding criteria by means of Weight Mean Formula. The remarks were from the Likert's Scale furthermore, according to the computed results, the project shows a consistent rating that is above average.

4.1.1 Efficiency

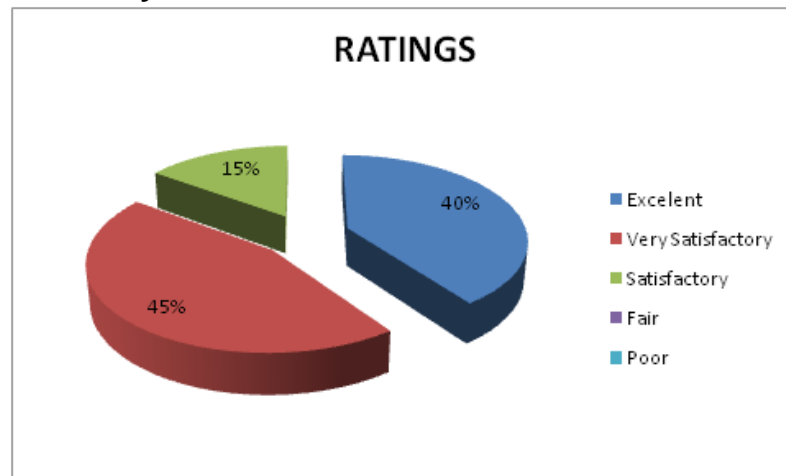


Figure 4.2: Survey Result # 1

For the testing the efficiency of the project, nine out of twenty students answered that it is “very satisfactory” while eight out of twenty students said that it is “excellent” and the remaining three said that it is “satisfactory”. By evaluating the results, the proponents were able to know if the project is more efficient in printing documents rather than going outside the campus. The students will get to print their files with less effort.

4.1.2 Accuracy

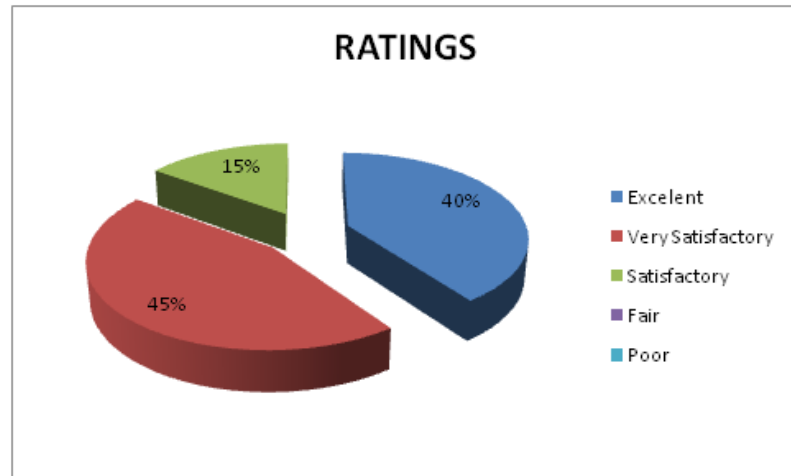


Figure 4.3: Survey Result # 2

For the testing the efficiency of the project, nine out of twenty students answered that it is “very satisfactory” while eight out of twenty students said that it is “excellent” and the remaining three said that it is “satisfactory”. Getting this result, the proponents were able to know if the project is accurate in terms of giving the desired service of the user. The system will provide accurate countdown and correct number of prints.

4.1.3 Reliability

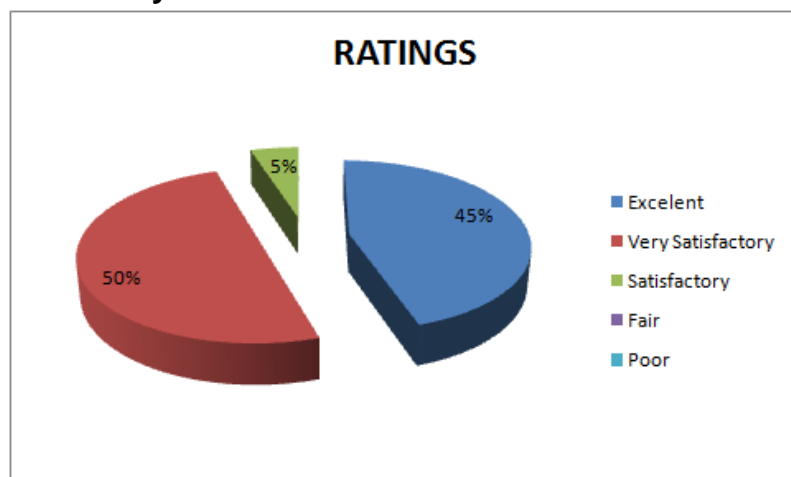


Figure 4.4: Survey Result # 3

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For testing the reliability of the project, ten out of twenty students answered that it is “very satisfactory” while nine out of twenty answered that it is “excellent” and the remaining student think that it “satisfactory”. This shows that the project is reliable in terms of printing quality documents. Users will no longer go outside the campus thus the user can rely on the project whenever they intend to print documentation.

4.1.4 Usefulness

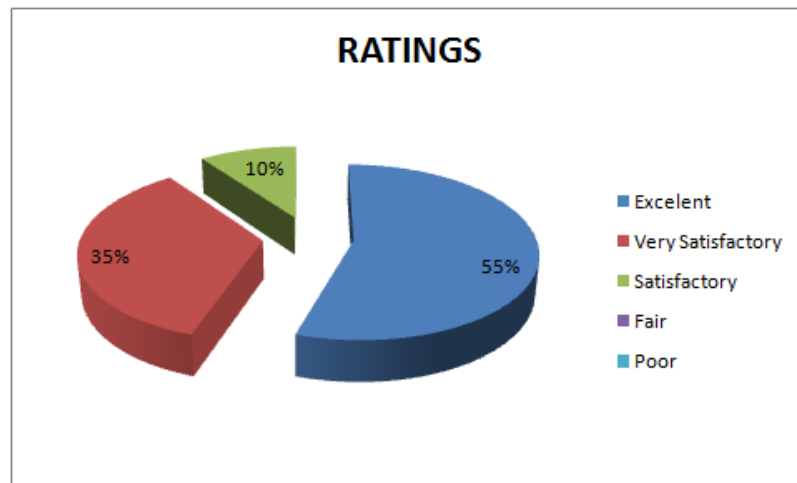


Figure 4.5: Survey Result # 4

For testing of the usefulness of the project, twelve out of twenty students said that it is “excellent”, while seven out twenty said that it is “very satisfactory” and the remaining think that it is “satisfactory”. This shows that the project is very useful for users in printing document.

4.1.5 User Friendliness

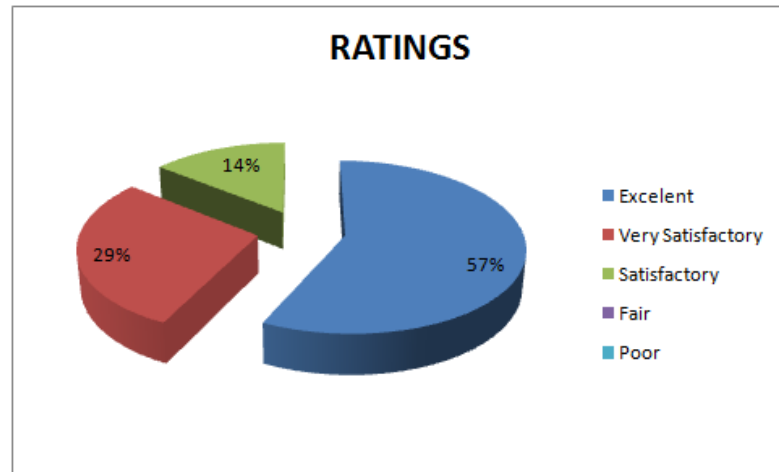


Figure 4.6: Survey Result # 5

The table shows that eleven out of twenty students said that the project is “excellent” while six out of twenty said that it is “very satisfactory” while the remaining students said that it is “satisfactory”. Getting this result, the proponents were able to know if the project can be easily understood and used.



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Chapter 5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The proponents have made several conclusions from the designed project. An initial conclusion is the overall efficiency of the project is more acceptable rather than the traditionally going out of the campus for printing purposes. The proponents decided to make the said design project because of the problems encounter on present system; going outside of the campus is time consuming inaccurate computation of total charges

Another conclusion is the heightened accuracy and reliability of the system in terms of printing services. Evaluated results drawn the conclusion that students can rely on the accuracy the system can provide. Add to that the Internet feature of the system. For this users will also get to use the internet to download and import missing files into their worksheets while editing.

The proponents achieved their objectives in making this project. They had finished making design project, which have given satisfaction to their stated problem. They developed a design project to have a system that will give instant printing service inside the building rather than going outside of the campus.



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5.2 Recommendation

There are a number of research areas in which improvements would bring better results throughout the system. The following is a list of recommended research areas for this product:

5.2.1 Multi-Coin acceptor and Coin dispenser

Instead of single recognize coin acceptor a Multi Coin acceptor and Coin Dispenser has dual function. Aside from accepting coins being inserted it also has the capability to dispense coins when the user decides to cancel the operation. These conditions are not present in the current system since the project is only using coin acceptor.

5.2.2 Multi Function Printer

There are some improvements that can also be made in the project such as using Multi Function Printer. It includes a printer, scanner and copier for variety of purposes. The current design project is using single function printer limited for “print only” function. By using the recommended 5-1 printer, the system is able to store rims of bond paper which the current system printer doesn't support.