INFORMATION SYSTEMS DEVELOPMENT AND TECHNOLOGY PLAN FOR F.I AUTO SUPPLY

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ABSTRACT
F.I Auto Supply is a small retail store of auto parts located in Salvacion, Panabo City. The company has dealt daily with the traditional manual transaction process, which gave them difficulties in tracking the conciseness of the company's products' sales and inventory. The researchers proposed an Auto Supply Management System with Automated Inventory Mobile Scanning to aid the problem. This system will help automate the company's inventory and sales conduct and produce concise and accurate information regarding how well the business is running in a specified period. Moreover, it will also help them be attentive to the number of stocks available in the store to make plans ahead of time, like what supplier the products should be coming from, and estimate the time of transaction. Furthermore¸the proposed system also gives the business an edge to a higher quality of image branding and customer relationships thru enhanced service time efficiency.

Key words: Auto supply retail business, automated inventory mobile scanning, IT system and infrastructure, sales and inventory management, time and energy efficiency, traditional manual transaction process.

1. INTRODUCTION
1.1 Background of the Company
The desire of Mr. and Mrs. Laruan to establish the company started way back in 2019. It was motivated by the yearning for financial growth to secure a promising future for the owners' children and to put into practice the faith in the Lord. The company name itself has been inspired by a joint statement and movement within the Born Again Christians sect, "Fruit of Intercession," shortened as 'F.I' in F.I Auto Supply. Last July 2021, the small family retailing business officially started, currently located at Brgy. Salvacion, Panabo City, is now pursuing ways for advancement within the auto supply industry. The company strives to be the number one

choice of customers, specifically car mechanics and companies that offer car or trucking services. The owners have chosen to penetrate that part of the industry since the sister-in-law of Mr. Laruan is well versed and is known already in the field, which has given them the advantage of building connections and good relationships with the clients.

1.2 Current Routines and Business Process
1.2.1 Current Routines
The daily routines of the company are praying and cleaning early in the morning before the official opening time of the store, and then the working shift will go straight until closing time. On a weekly basis, the owners go to the product supplier at least twice to buy stocks for replenishment. Moreover, the company also monitors parcels delivered to them at least twice a month.

Event Tables of Retail store: F.I. Auto Supply

Table 1. Event Table for Mondays to Saturdays

Start Time	End Time	Task	Duration
7:00 AM	7:30 AM	Prayer, Cleaning	30 minutes
7:30 AM	8:00 PM	Working time	12 hours & 30 minutes
8:00 PM	8:15 PM	Cleaning, Closing time	15 minutes
	Total number of duration:		**13 hours & 15 minutes**

Table 1 shows how the company spends its time during its regular working schedule, divided into at least three parts. As a family who have dedicated Christians, praying is highly prioritized as part of the schedule and put the organizing kinds of stuff next to it. In addition, as the business is still relatively easy to be handled by a minimum number of people, the official working shift goes straight from morning till evening since meal breaks can be squeezed in anytime. At precisely eight o'clock in the evening, the employee in charge will clean things that standardly take at least 15 minutes and then end the business day.

Table 2. Event Table for Sundays

Start Time	End Time	Task	Duration
12:45 PM	1:00 PM	Prayer, Cleaning	15 minutes
1:00 AM	6:00 PM	Working time	5 hours
6:00 PM	6:15 PM	Cleaning, Closing time	15 minutes
	Total number of duration:		**5 hours & 30 minutes**

Table 2 shows the store's business hours on Sundays differently from the regular shift. This change occurred since all of the staff leaves the whole morning as part of the rest time. The routines during Sundays are the same as the regular working days but have shortened time duration.

1.2.2 Business Process

As F.I Auto Supply is a family business, the employees working in the store are the owner's closest relatives, which naturally gives the sense to do multiple roles from time to time. During the working time, the assigned employee will see over the store; whenever there will be customers, it is a must to be attentive and secure social and approachable characteristics towards each person. As there will be sold products, it will be listed manually (pen and paper). If ever there are chances that the item sought is out of stock, it will also be noted while informing the client of the possible day and time, the buyers can return and avail the product. Moreover, on a weekly and monthly basis, the company also tracks its expenses and profits.

1.3 Problems Found

• **Traditional Manual Transaction Process.** As observed during the investigation, the listing of sold products and releasing of receipts was done with pen and paper.

• **Inconcise Inventory.** Based on our interview, the owners have so much trouble keeping up with the availability of the stocks since the store do not have an automated tracking system that could automatically generate real-time sales and in-store stock deductions.

• **Lack of IT Infrastructure.** Within the investigation duration, the only available computing machine in the store is a calculator.

1.4. Goals and Objectives
1.4.1 General Objectives

The researchers are expected to propose an IT system and infrastructure that will aid the company in having an efficient business process that covers its sales and inventory management on a daily to yearly basis, which can assist them towards being the number one choice in auto supply retailing in wherever places the owners plan to excel.

1.4.2 Specific Objectives

In alignment with the general objectives, the specific purposes of this study are:

• To propose an IT infrastructure that will aid the basic needs of the company's business process and improve its advancement a step ahead compared to other auto supply retail stores.

• To present a sales and inventory management system that can be efficient even at a low-cost IT infrastructure.

• To put forward proper data handling and concise information generation thru the proposed system to increase time and energy efficiency.

1.5 Organizational Structure

Figure 1: F.I Auto Supply Organizational Structure

Figure 1 shows the organizational structure of F.I Auto Supply. The owners are responsible for the executive tasks. In contrast, the owner's sister-in-law is responsible for managing the store's day-to-day business processes. At the same time, the employees handle the cleanliness of the store and assist the customers.

1.6 Stakeholders

Figure 2: F.I Auto Supply Stakeholders

Figure 2 shows the people that affect the company's business performance: the customers, government, suppliers, landlords, and employees.

PROPOSED INFORMATION SYSTEMS

The researchers propose an Auto Supply Management System with Automated Inventory Barcode Mobile Scanning to ease up the manual process done within the company's business process and be able to generate the necessary information needed to see the performance of the company at a specified time.

2.1 Review of the Related Study

2.1.1 Related Literature

One of the expeditious growing businesses in the industrial world is the retail industry [1]. It continuously targets the specific demands of the different needs of every customer day by day. Retail business can be in various versions, and it can be a micro or macro market which depends on the targeted consumers of convenience. Consequently, the retail industry requires an organized system, proper sales and inventory management, and effective business strategies.

According to [2], inventory management involves raw materials and finished products that go under ordering, keeping, manipulating, and selling. Inventory is a significant asset of a business yet, also can be a liability from different perspectives. In retail businesses like auto supplies, it is a necessary objective to maintain the number of parts and supplies. Moreover, since we are in the 21st century, where automobiles and vehicles are standard, the auto retailing business must keep up time consciousness and speed in achieving customer satisfaction. Retail businesses should adapt to modern changes like systemized processes for faster and more efficient work.

Small business or retail store is more likely to fail or last in a minimum time due to a lack of adaptation to computerized inventory and accounting system that aid and extends the business's life span [3]. Keeping up in this technological-based era will help businesses boost and update the workloads processes, save time and be energy efficient.

2.1.2 Related System

Warehousing Management System

A warehouse management system (WMS) comes as a handy and essential method for every warehouse. Compared to the manual type, an automated warehousing system has increased reliability, effectivity, and less exertion of effort in its results. WMS aids in lessening costs by making the warehouse system effective [4]. The WMS particles perform well for improved warehouse processes such as zones and bins, targeted grabs and retain, and computer-controlled tracking systems. The storage facility must be divided into zones and bins to conduct oriented grabs and retains. A zone can be either an eligible to receive zone or an inventory stock zone, and each zone can have one or more bins. The need for automated processes stems from the fact that manual handling can lead to human errors, which can mitigate warehouse efficiency [4]. A warehouse's main objective is to control the flow and management of inventory most efficiently and effectively [6]. WMS aids in lessening costs by making the warehouse system effectual. It is intended for companies that have to send off and receive goods while at the same time optimizing space use and identifying where the goods are sorted at a specific time [4].

Inventory Management System

Most organizations use a computerized inventory control system and its transcendence, quality, consistency, and friendly approach. Moreover, it is a system that eradicates redundancy or reproduction and unrelated data that could lead to errors in the business. It can also be transformed into an environment with various users and minor revisions [5]. Furthermore, an inventory management control system is a strategy that supervises and tracks the flow of inventory stock within a company. It has developed over the years, from a paper-based recording system to the use of barcode technology, which was launched in 1948 by Bernard Silver [7].

Barcode Mobile Scanning

Using smartphone sensors, barcode images could be scanned and translated into the item or product identification using barcodes. Barcodes are a common method for identifying commodities and products in

supermarkets, shopping malls, and grocery stores. It has been widely used for years and is considered an industry standard [8]. The barcode system can also be linked with smartphone technology to provide customers with much more helpful services [9]. As a result of the effective adoption of e-commerce services, the utilization of smartphone cameras for barcode scanning has become more prevalent [10]. The barcode zone will be detected and scanned by the smartphone cameras. From that, barcode localization algorithms decode the collected barcode images and generate the barcode's binary value [8]. The barcode enables extra items or commodities to be retrieved from other connected electronic systems and databases [11].
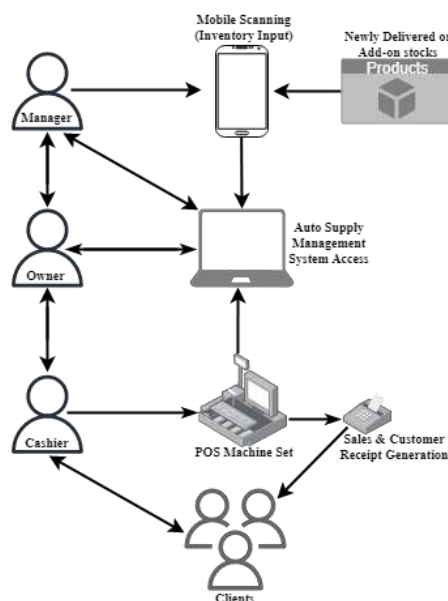
2.2 Proposed Information Systems
2.2.1 Functionality
Auto Supply Management System with Automated Inventory Mobile Scanning offers:
- The capability to use a mobile device as a portable scanner also lets the user manually input the total number of each product in stock upon delivery or add-ons, especially those products that are in large count.
- Easier inventory control.
- Real-time monitoring of sales activity.
- Capability to assess customer interests and behaviors.
- Simpler way to assess business performance.

2.2.2 System Architecture

Figure 3: System Architecture for F.I Auto Supply

Figure 3 shows the Auto Supply Management System with Automated Inventory Mobile Scanning. Whenever there will be added or new items for the store, the barcodes will be scanned by a mobile device scanner app, which lets the store manager input the total number of the newly arrived products. Then the information will be generated to the management system on a laptop computer. Whenever clients buy items, the chosen products will be acknowledged by the cashier, and there will be printed sales and customer receipts. Moreover, the sales transaction confirmed by the POS Machine will also be generated in the management system. Furthermore, the management system will do the availability calculations by adding stocks by the automated inventory mobile scanning and stock deduction by the approved sales transaction. In addition, the management

system can also receive and generate information in a specified time, like the most selling item and unavailable items that customers seek, for example, which could be set on by the managerial or executive positions.

2.2.3 Economic Feasibility

Table 2. Cost structure of F.I Auto Supply

Cost Description	Cost
Operational Cost	Php 64, 372
Maintenance Cost	Php 18, 598
Total Cost	**Php 82, 970**

Table 3 shows the cost structure of the proposed IT infrastructure and peopleware with its corresponding prices and session fees, respectively.

PROPOSED IT INFRASTRUTURE
3.1 Proposed Computer Hardware
The researchers proposed this computer hardware for the store, which helps save and secure documents. In addition, these types of equipment can aid in the improvement of store transactions, sales, inventory recording, tracking, and storing essential records.

Laptop
Laptops are personal computers known for its portability and have all the components and functions of traditional desktops. This computer device is designed to maximize space to store and secure critical data.

Smartphone
In business settings, one of the most fundamental goals of mobile phones is to make corporate information more accessible. It is a handheld device with a wide use, can be for capturing images, scanning codes, making doscuments, spreadsheets and presentations, and is usually used in accessing Internet platforms.

POS Machine
A Point of Sale (POS) machine is a terminal where the cash register processes credit or debit cards, completes the transaction and keeps sales on track.

Printer
A printer is an external machine that takes the electronic information stored on a computer and produces a hard copy.

Barcode Scanner
Barcode scanners are optical devices that can read printed barcodes, decode the data, and send the information to a server.

Table 4. Proposed Computer Hardware for F.I Auto Supply

Computer Hardware	Specifications	Unit Cost	Qty
Laptop	8GB DDR4 256GB SSD OS Windows 10 Home 14-inch FHD display, a 4.19mm ultra-thin bezel, the immersive experience CPU Dual-Core Speed: 1.2GHz-3.4 GHz DDR4 : 8GB (3200 Mbps) SSD : M.2 256GB, 2280, PCIE 3.0 Full-size Backlit Chiclet Keyboard Touchpad with Multi-touch Wifi + BT 1*1 AC+BT5.1 (AC9461) Camera 720P Battery 11.4V/55Wh Adapter 1 (65W PD 3.0 type-C) Cable Type-C 1.8m lightweight full metal body SD card slot - 1 (micro SD) HDMI - 1 (HDMI 1.4) USB - USB 2.0 x1 / USB 3.0 x2 Earphone - 1 (3.55mm) Type C – 1 (data)+1 Charger interface – 1 Lock -1 Camera switch - 1 Width: 323.5 mm Depth: 219.5mm Height: 16.3mm Weight1.48 kg [12].	Php 24, 990 [12].	1
Smartphone	RAM: 8GB ROM: 256GB Helio G95 Chipset 6.95" FHD+ Super Fluid Display 90Hz Main Camera 64MP Front Camera 16MP 5000mAh Battery Cinematic Dual Speakers with DTS USB Type-C 2.0	Php 11, 990 [12].	1

Network 2G / 3G / 4G [12].

		Price	Qty
POS Machine	- Cloud-based (No monthly) - Real-time sales monitoring - Daily to monthly total sales generation - Stock inventory - Offline printing - Free logo, header, or footer on receipt - Compatible for dine-in, take-out, or delivery services - Automatic cash drawer - Electronic money detector - Tablet stand [13].	Php 11, 900 [13].	1
Printer	Printer Type: Ink Tank Functionality: Print Only Printer Output: Color Connectivity: USB Compatibility: Windows 10, Windows 8.1, Windows 7 SP1. Note: This printer is not compatible with MAC OS No LCD on the printer Pages per minute: 8.8 ipm (Black), 5 ipm (Colour) Cost per page: 9 paise (Black & White), 32 paise (Colour) - As per ISO standards Ideal usage: Home and Small office, Regular / Heavy usage (more than 300 pages per month) Page size supported: 4.0"x6.0" till A4 / Letter / Legal / A5 / B5 Print resolution: 4800x1200 dpi Compatible Ink Bottle: GI-790 (BK), GI-790 (Cyan, Magenta, Yellow) [15] Page yield: 6000 pgs (BK), 7000 pgs (color) - As per ISO standards [14].	Php 5, 595 [14].	1
Barcode Scanner	Wireless USB Barcode Scanner Sensor: 960 * 640 COMS Scan mode: manual scan Speed: 1300 times/S Scan: 18cm scan Angle: Horizontal: 72°, Vertical: 82°, Rotation: 360° Professional 1D / 2D / QR barcode scanning, high speed, high precision, good at decoding irregular barcodes. High speed and high-speed decoding and high scanning accuracy. Built-in 1800mAh capacity battery, long standby time.	Php 3, 199 [15].	1

Built-in flash memory can store more than 4000 barcodes.

Support automatic function, power saving, easy to use.

Compatible with different systems: Windows XP, Windows7, Windows 8, Windows 10, IOS, Android, Linux, and more.

Comes with a USB cable and wireless receiver for easy use [15].

Total Proposed Computer Hardware Costs:	**Php 45, 684**

3.2 Proposed Operating System Patforms

The researchers will use an operating system and a platform that are compatible with the proposed system, which are Windows 10 and Apache NetBeans in its most recent versions.

Microsoft Windows 10

Microsoft Windows 10 is an Operating System (OS) that supports various devices, including desktop computers, tablets, laptops, and other devices. It also supports software applications and has implemented protection. In addition, this is already installed with bought laptop or desktop computers.

Apache NetBeans

Apache Netbeans is an Integrated Development Environment (IDE) that can run in a wide range of operating systems that can support Java like Windows, Linux, and Mac OSX. It offers necessary editors, templates, and wizards that aid in creating applications in Java, PHP, CSS, and other languages. It can be downloaded, installed, and be used freely in the latest operating system versions and works smoothly on advanced computer specifications.

Table 5. Proposed Operating System Platforms for F.I Auto Supply

OS Platform	Specifications	Unit Cost	Qty
Windows 10	Requirements [16]: RAM: 1 GHz or above	Free	1
	Hard Disk Storage: At least 16GB (32-bit) or 20GB (64-bit) Operating Systems		
	Graphics Card: DirectX 9 or advanced with WDDM 1.0 driver		
	Display: At least 800x600		
Apache NetBeans	- Editor for a variety of programming languages with syntax color-coding [17], [18]. - Component inspector, object browser, debugger, and with assistive wizard dialogs [17], [18].	Free	1
Total Operating System Platforms Costs:		**Php 0**	

Table 5 shows the cost description of the proposed operating system platforms which are needed to implement the proposed information system.

3.3 Proposed Enterprise Software Applications
The researchers propose the latest version of well-known office applications to boost up the company's data management in both soft and hard copies of the necessary information needed to analyze business transactions.

Microsoft Office Professional 2016
A pcakage that offers variety of advanced useful tools for business and workplace's presentations, calculations, listing and more. It provides security and common cloud storage for dataand information without technical risks [19].

Table 6. Proposed Enterprise Software Applications for F.I Auto Supply

Enterprise Software	Specifications	Unit Cost	Qty
Microsoft Office Professional 2016	Applications: - Word - Excel - PowerPoint It can be used on desktops, tablets, laptops, and mobile devices. Compatible with Windows, macOS, and Android [19].	Php 1, 455 [19].	1
Total Proposed Enterprise Software Applications Costs:		**Php 1, 430**	

Table 6 shows the specifications and cost of Microsoft Office Professional 2016, which is proposed as an enterprise software application for the auto supply store.

3.4 Proposed Data Management
Data management plays a crucial role in the business since it allows companies to complete significant functions such as information organization; also, it offers data back ups in the event of an improper file system.

Microsoft SQL Server
Microsoft SQL Server is a software program whose primary purpose is to handle a wide range of transaction processing and solve issues by accessing data.

Table 7. Proposed Data Management for F.I Auto Supply

Data Management	Specifications	Unit Cost	Qty
Microsoft SQL Server	Supported database management features.	Free	1
Total Proposed Data Management Costs:		**Php 0**	

Table 7 shows the specification and cost for the proposed data management for the proposed Auto Supply Management System with Automated Inventory Mobile Scanning.

3.5 Proposed Network and Telecommunications
The researchers suggest implementing an Internet with a landline connection for the company to utilize for the implementation of the management system.

GFiber Unli Plan 2099
Globe Telecom is one of the known telecom companies here in the Philippines. It has a wide variety of service offers in the form of plans, one of which is the fiber Internet connectivity, specifically GFiber Unli Plan 2099.

Table 8. Proposed Network and Telecommunications for F.I Auto Supply

Network & Telecom-munication	Specifications	Unit Cost	Qty
GFiber Unli Plan 2099	Free installation; unlimited calls for Globe and TM networks with local area landline; 200 mbps speed free boost up for sic months; free app subscriptions (Viu, HBO Go, Prime Video) and 24/7 health consultations (konsultaMD) [20].	Php 2, 099 / month [20].	1
Total Proposed Network & Telecommunication Costs:		**Php 2, 099**	

Table 8 presents the offers within the GFiber Unli Plan 2099 and its cost upon enforcement.

3.6 Proposed Internet Platforms
For the business to extend its leverage within the competition, launching online promotions can widen the company's customer range to cater.

E-commerce
E-commerce is the utilization of the Internet in selling and buying a range of products and services. Customers have the option to either pay via bank transfers or e-money or simply pay upon delivery [21]. Moreover, there will be sections intended for customer reviews that can boost the company's performance evaluation.

Social Media Platforms
Beyond the function of sharing information with the use of electronic communication, social media platforms like Facebook and Instagram have also been used to promote services and products and sell by connecting to the websites provided by the sellers thru links.

Table 9. Proposed Internet Platforms for F.I Auto Supply

Internet Platforms	Specifications	Unit Cost	Qty
E-commerce	Allowing customers to purchase thru Shopee and Lazada.	Free	2
Social Media Platforms	Ables the company to promote its products to groups of target customers online thru Facebook and Instagram.	Free	2
Total Proposed Internet Platforms Costs:		**Php 0**	

Table 9 presents the specifications of the proposed Internet platforms for the advancement of F.I Auto Supply.

3.7 Proposed IT Manpower

A significant part of the business' success is the workforce. The researchers proposed this IT manpower to guarantee, support, and reach the company's goals.

Computer System Analyst

Commence computer system upgrades, corresponds and produces technical reports; ensures the functionality of the system and coordinates organzational network systems [22].

Computer Technician

Focuses on the maintenance and repairs of the hardware and software of the computer. In addition, its networks resolve computer problems.

Table 10. Proposed IT Manpower for F.I Auto Supply

IT Manpower	Salary	Qty
Computer System Analyst (on-call)	Php 2, 000 / session [23].	1
Computer Technician (on-call)	Php 1, 800 / session.	1
Total Proposed Computer Hardware Costs:	**Php 11, 800**	

Table 10 shows the proposed IT workforce for F.I Auto Supply and its salary.

CONCLUSION AND RECOMMENDATION

4.1 Conclusions

F.I Auto Supply has based its sales transactions on the manual pen and paper process. However, in the long run, it has been hard to track the company's stock demands and inventory which troubles its management flow and customer relationship development. With the use of the Auto Supply Management System with Automated Inventory Mobile Scanning, the company will be able to implement real-time sales and stocks management which also boosts image integrity and service time trustworthiness.

4.2 Recommendations

The use of IT systems and infrastructure can demand a pretty huge budget, and the adjustment time can be somehow troubling. However, with patience and understanding, the proposed system will be able to serve its purpose in time. Also, it is encouraged to build relationships with IS and IT professionals for easier access to systems improvement consultations, which can be done on an informal communication basis. Moreover, it is also encouraged that the company will install security equipment such as closed-circuit television (CCTV) cameras. Furthermore, to the future researchers of the business, it is highly recommended to widen the use of the proposed system to processes that are external like delivery tracking done in e-commerce and more.

REFERENCES

1. R. B. Aleem, "Sales and Inventory Management System," Doctoral dissertarion, Business Information System, University Technology of PETRONAS, Tronoh, Perak, 2013. [Online]. Available:http://utpedia.utp.edu.my/

2. A. Hayes, "Inventory Management," investopedia, 2022.[Online]. Available: www.investopedia.com.

3. Y. Bullock, "Strategies Used to Transition from Manual to Computerized Accounting in Small Businesses", Doctoral dissertation, Dept. Bus. Admin., Walden University, Minneapolis, MN., 2021. [Online]. Available:https://scholarworks.waldenu.edu/

4. Technical White Paper, "Technical White Paper%2C Warehouse Management in Microsoft Dynamics", NAV 2013, [Online]. Available: www.bing.com, 2013, (accessed May 21, 2022).

5. L. Tundura, Tundura, "Effect of Inventory Control Strategies on Inventory Record Accuracy in Kenya Power Company", Nakuru, *Journal of Investment and Management*, vol. 5, no. 5, p. 82, 2016, doi: 10.11648/j.jim.20160505.16.

6. S. Seiferman, Seifermann, J. Böllhoff, J. Metternich, and A. Bellaghnach, "Evaluation of Work Measurement Concepts for a Cellular Manufacturing Reference Line to Enable Low Cost Automation for Lean Machining", *Procedia CIRP*, vol. 17, no. 17, pp. 588–593, 2014, doi: 10.1016/j.procir.2014.01.065.

7. S. Sri Krishna Kumar, G. Chandni, A. L. Meenal, T. S. Kalaimohan, R. Senthil Kumar, and K. R. Sugavanam, "BLE Enhanced Decentralised Work Time Sheet and Real Time Monitoring using Smart ID Card", *ARPN J. Eng. Appl. Sci.*, vol. 10, no. 18, pp. 8080–8084, Oct. 2015, [Online]. Available: www.researchgate.net/publication/

8. O. Gallo and R. Manduchi, "Reading 1D Barcodes with Mobile Phones using Deformable Templates," *IEEE Transactions on Pattern Analysis and Machine Intelligence,* vol. 33, pp. 1834-1843, 2011.

9. E.Y. Daraghmi, C. F. Lin, and S. M. Yuan, "Mobile Phone Enabled Barcode Recognition for Preferences Monitoring," in Advances in Computer Science and Education Applications, ed Berlin Heidelberg: Springer 2011, pp. 279-302.

10. G. Sörös and C. Flörkemeier, "Blur-resistant joint 1D and 2D barcode localization for smartphones," *Association for Computing Machiner,* New York, NY, United States, pp. 11-19, 2013, doi: 10.1145/2541831.

11. D. Chai and F. Hock, "Locating and Decoding EAN-13 Barcodes from Images Captured by Digital Cameras," *Fifth International Conference on Information Communications and Signal Processing,* 2005, pp. 1595-1599, doi: 10.1109/ICICS.2005.1689328.

12. infinixofficialstore, 2021, [Online]. Available: www.shopee.ph.

13. megashop.ph, 2020, [Online]. Available: www.shopee.ph.

14. octagoncomputersuperstore, 2020, [Online]. Available: www.shopee.ph.

15. maia.philippines, 2019, [Online]. Available: www.shopee.ph.

16. Microsoft, "Windows 10 system requirements," 2022, [Online]. Available: www.microsoft.com/en-ph/

17. Apache Software Foundation, "Apache Netbeans 13," 2020, [Online]. Available: https://netbeans.apache.org/

18. T. Boudreau, J.Glick, S. Greene, V. Spurlin, J. J. Woehr, "NetBeans: The Definitive Guide: Developing, Debugging, and Deploying Java Code", pp. 1-96, Jun. 2011, [Online]. Available: books.google.com.ph

19. Computer Today, "Microsoft Office Professional 2016 plus Microsoft Activation Key GLOBAL". 2022, [Online]. Available: www.computertoday.ecwid.com.

20. Globe, " GFiber Unli Plan 2099 - Free Speed boost for 6 months and Installation (Cross sell)," 2021, [Online]. Available: www. globe.com.ph.

21. J.C. Eliguen, E. Maniwang, M. Dojo, R. B. Leron, G. Jadraque, "Information Systems Development Plan for Dojo Upholstery," *International Journal of Scientific Research and Engineering Department,* vol. 1, no. 3, pp. 1491-1497, June 2021.

22. Betterteam, "Computer Analyst Job Description," 2022, [Online]. Available: www.betterteam.com.

23. Talentcom, "System Analyst Average Salaray in Philippines 2022," 2022, [Online]. Available: www.ph.talent.com.