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INFORMATION SYSTEM DEVELOPMENT PLAN FOR THE BERNA'S BAKESHOP

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ABSTRACT
The purpose of this research is to explain how technology bringing business in a satisfactory and successful outcome. The proposed system will help the business flow in a most convenient and lessen the time of exposure on how to handle things independently. The baking business isn't a simple business that does not take a short time. It needs a system to handle accurately and faster. The daily operation includes mixing of ingredients, baking, packaging, sorting of orders, display and deliver to the customer. The employees should mentally present to calculate, record, and list the type of bread to be delivered where it is the most problem they encountered.
To address the problem, the researchers think a great system of using Bakery Management System (BMS) whereas it keeps tracking the record of product information, the business flow, order management, inventory tracking, and effective communication between the delivery and customer.

Keywords: Bakery Management System, Business Flow, Business Process, Daily Problem, Inventory Tracking

INTRODUCTION
1.1 Background of the company
The Berna's Bakeshop was established on September 6, 2000, and was first located in Sagrada, Malagamot Panacan Davao City. And last year it currently residing in St. Vincent Ilang, Davao City, Davao del Sur because the building is affected by the road widening.
Mr. Nilo Bernas is an employee of Panadero for almost 1 year and other bakeries known in Davao City. In his experienced, he decided to build his bakery with a starting of 45,000. Over a few years, Berna's Bakeshop becomes a successful and leading bakery in Malagamot Area. However, Noel D. Bernas and with the help of his brother Nilo Jr D. Bernas, they are the one who looks and manage their Father business. In contrast, The Berna's Bakeshop aimed to give quality service and delicious bread to all customers. Their service towards the

customer is the secret why their business continues to grow over 21 years. The communication is indeed helpful. Moreover, if customers are satisfied with the product, they will repeat purchasing, showing loyalty, and telling good things to other people. Otherwise, they will move to another brand or may complain and express their dislikes to the company and others. It can have long-term impact on company's image [1].a

As we enter the world of technology we should also apply it in businesses to have convenient and excellent service. Unfortunately, there is some country that isn't appreciated and used. Somewhere in Russia large baking enterprises are not interested in the development of bread production near consumers, and the state and local governments are not paying enough attention to the development of small rural businesses, including bakery, which leads to its reduction and, as a result – to a reduction in the quality of life of the rural population [2].

However, when technology grows over the years IT becomes used in manufacturing include process modeling, production scheduling, and control, materials
management information systems, and logistics. Indeed, in most cases where IT has been used
proactively to redesign work in a given firm, this redesign has most likely been in the manufacturing function and industrial engineers are the most likely individuals to have carried it out [3].

And today, when we start implementing this Bakery Management System, it surely makes them in most convenient and well organized on their daily operations in the baking industry, where it will use in their inventory tracking, orders, record, communication, and business flow means of processing the current manual operation of the Bernas Bakeshop for both near and far customers.

1.2Current routines and business process

1.2.1 Current Routines

The daily routine of the specialized business comprises of producing or baking bread and biscuits for delivery and presentation. The assigned staff sanitized first the kitchen area and then prepares the dough to make the bread, buns, and other baked goods. Moreover, the assistant baker cleans the baking 'bins' and makes a list of the items they will need to bake. Cleaning the environment, such as cleaning the floor with the mop is part of the business's routine. The baker's deliverer's daily tasks include delivering bread to their customers. The auditor then went over the wholesale for the day.

Table 1. Event Table of Berna's Bakeshop

Start Time	End Time	Task	Duration
4:00 AM	4:10 AM	Log in	10 MINS.
4:10 AM	4:30 AM	Cleaning and preparing all the baked goods.	20 MINS.
4:30 AM	5:30 AM	Baking breads and biscuits.	1 HR.
5:30 AM	7:00 AM	Delivering to their customers.	1 HR. And 30 MINS.
7:00 AM	11:30 AM	Entertain and serve upcoming customers.	5 HRS. And 30 MINS.
11:30 AM	12:00 NN	Lunch break. Then resume back to work.	30 MINS.
1:00 PM	1:30 PM	Bake the 2nd batch of bread.	30 MINS.
1:30 PM	2:30 PM	Continue working	1 HR.
2:30 PM	3:00 PM	Break Time	30 MINS.
3:00 PM	4:00 PM	Repacking breads and biscuits.	1 HR.
4:00 PM	6:30 PM	Continuation of serving customers.	2 HRS. And 30 MINS.
6:30 PM	7:00 PM	Log out. Cleaning the workplace before leaving.	30 MINS.

1.2.2 Business Process

Berna's Bakery is a wholesale bakery that opens early in the morning and sells hot "Pandesals." Raw ingredients are supplied to their store daily, and after reviewing the orders received; they will move straight to inventory and be utilized in the baking station. Once baked, the products will be packaged and ready to be distributed. One of their business processes is selling items directly to customers and other retailers. The bakers' deliverer will retrieve and replace the items with fresh ones at the time of delivery as the goods spoil in the store where they were delivered. In addition, the company displays its merchandise, entertains guests, and serves potential clients.

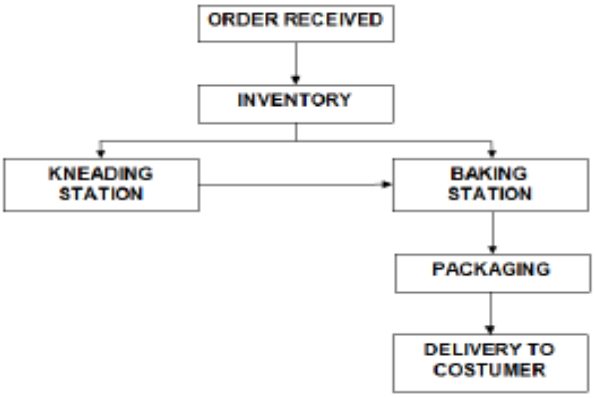

Figure 1: Business Process of Berna's Bakeshop

1.3 Existing Technologies

Table 2: Existing Technologies of Berna's Bakeshop

Technology	Qty.	Description
Mobile phone	4	Use as a medium for receiving orders from the customers, it may be through text or call. The mobile phones are applicable to all networks for the customers' convenience.
Motorcycle	4	Use as their means of transporting or delivering baked products to their customers.
Rack Oven	1	This is the main equipment used in the bakeshop from making breads and other baked products. It utilizes special carts or racks to support the baking pans. These racks are also used in their dough prep and proofing stages and in the baking process.
Mixers	1	It helps them to automate the repetitive tasks of stirring, whisking or beating. It may also be used to knead when the beaters are replaced with a dough hook.
Proofing cabinets	2	It allows dough to rise more easily and keep food warm. It aids with the regulation of temperature and humidity, resulting in perfect conditions for rising dough prior to baking.

1.4 Problems Found

• **Inventory**. Based on our interview, they apply the manual process in inventory by using paper and pen. There are times of error in calculating the amount of product delivered and their profit daily. The owner also sights that there are times an employee forgets to write down a sale, forgets to mention that the product has been removed from the inventory, and the owner expects the items to still be available for a customer during the sale.

• **Delivery.** In listing orders and where they will be delivered, the business uses a paper-based system causing errors including wrong place of order, missed order deadlines, and forgotten orders. The owner sights that it is normal for them to have an agreement between their retail store customers to deliver freshly baked products in stores every 4-5 days and that goes without proper contacts between each other. However, there are times that on the actual delivery, their retail store customers refuse to buy and pay their consistent orders resulting in the excess of bread for the bakeshop.

• **Customers.** The business uses 4 mobile phones in receiving orders however, the owner sights that customers often say that they don't have the proper contact information of the bakeshop. There are times that if they want to order, they wait for days that the deliverer will go back for the bakeshops' consistent retail customer nearby before they can order.

1.5 Goal and objectives

1.5.1 General Objectives

The researchers are expected to propose an effective way on how to enhance and develop the existing business that is chosen, which is a Bakery Shop. Most of in this type of business field they tend to stick to manual or traditional processing method in every day operation of their business either internal or external transaction because they already have the thinking that the traditional way of business processing method or system are more reliable and efficient to use than modern business processing method, that's why the researchers think and address to this issue using and adapting to modern Information System to provide reliable organization of information, solid data management and processing, that will help the company to have better service and trade.

1.5.2 Specific Objectives

In line with the general objective, the specific aim of this study is:

- Create Software Application for accessible purchase of products that the Admin and Customers can access it.
- Replace the current manual processing method by using Computer Technologies and Software Applications such as:

1. Advance Purchase Ordering System (APOS)
   The customer will Download the Application and choice their order then the Order will be automatically recorded.

- Ensure that all the products meet quality standards based on food safety protocols using the proposed Upgraded System APOS.

1.6 Organizational Structure

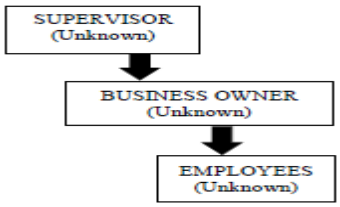

Figure 2: Organizational Structure of Berna's Bakeshop

Berna's Bakeshop, a business where the owner is the proprietor itself, followed by Supervisor who organizing workflow and ensuring that employees understand their duties or delegated tasks and the employee who worked for the company.

1.7 Stakeholders

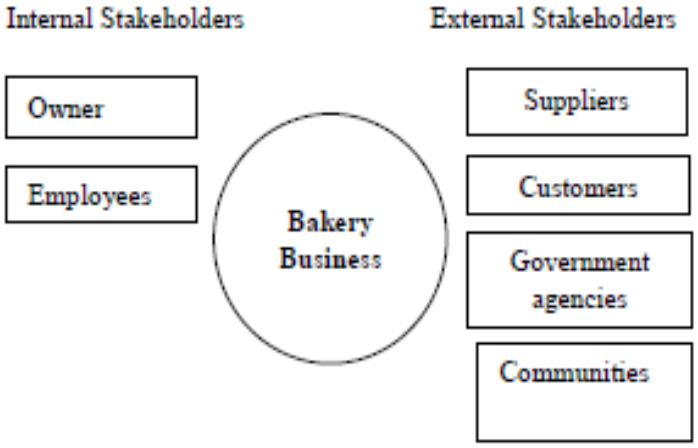

Figure 3: Stakeholders of Berna's Bakeshop

Owner, Employees, Suppliers, Customers, Government Agencies, and Communities can consider to be a significant part of the stakeholders of Berna's Bakeshop.

Owner: The owner has the ultimate responsibility for managing the business process, doing inventory, analyzing, and identifying customer satisfaction.

Employees: The master baker will provide instructions to his assistants as to what kind of pastries will do on that certain day. The packer will do the sorting of bread and pack it after all. The deliveryman will deliver the bread and biscuits to the customers, after that he will report the money to the owner for recording.

Suppliers: They are the suppliers of all ingredients in making bread such as sugar, flour, cellophane, oil, milk, eggs, yeast, and others.

Customers: The customer or buyer is the most important part of this business. They buy the product to sell it in their store.

Government agencies: The government will provide a refund if there is an accident happen in the business. Also, they check the production floor if the business follows the safety protocol and collect the taxes every month.
Community The community is the reason why the business is growing. They purchase the bread as food or sell it to others.

PROPOSED INFORMATION SYSTEM

The researchers proposed a Bakery Management System to keep records of all of their data in one place, keeping it easier to manage and lowering the risk of errors that will stimulate the growth of the business; this will help to boost the company's growth.

2.1 Review of Related Study

2.1.1 Related Literature

When it comes to the manufacturing of baked products, the food industry has a unique position in the processing industry. R's bakeshop is a business that produces bread daily. There are several distinct sorts of bread produced by that company. Products are created in the form of sweet bread and wheat bread, each with a distinct flavor profile. There were problems with the items during the manufacturing process, and the defective product became a reject product. Many concerns might arise in a bakery business, including inventory and waste production, which decrease sales performance. Researchers realized that the bakery lacked a database and information system for tracking the quantity of defective bread made, so they set out to construct one as well as construct an intelligence business system to track the quality of R Bakery's products [4].

Furthermore, food waste is becoming a global concern in Mediterranean and Arab countries. Nearly one billion people are hungry, yet up to half of the food produced are wasted. That is enough to feed the world's hungry. Growing food that is never eaten destroys ecosystems and emits greenhouse gas (GHG) emissions. However, there may be unexpected solutions to one of the world's most severe environmental and social issues. This multi-faceted problem requires a multi-pronged strategy. Technology is essential for adoption Creativity is essential for reducing food waste [5].

In the capital region of Helsinki, Vantaa, and Espoo, there are lots of cake and pastry shops. Furthermore, the majority of cakes and pastry goods are mass-produced in factories. As a result, the client suffers from a loss of quality and freshness. Furthermore, the cost of hand-made pastries from a pastry shop is considerable since they must pay significant manufacturing, material, facility, and distribution expenses. As a consequence, an online bakery would be an excellent choice for a small business with limited resources [6].

Maintaining a correct product inventory is a struggle for many small business owners. Small companies, unlike major chains, rarely have the luxury of ample storage space, so owners must be alert to avoid running out of essential supplies or carrying too much inventory [7]. Every year, bakeries grow and adapt their production technique and trade to meet the demands of their customers, expanding their goods and services. Because of their lengthy history, bakeries have always drawn consumers of various ages, genders, socioeconomic classes, and cultures [8].

2.1.2 Related System

The Information System Bakery Management System was created to completely replace the previous traditional system while also including some new useful features. The quantity of each raw material required can be tracked by users. It will assist them in estimating how much material they will use. They can save bakery recipes. It will be beneficial. They will need to define the amount of raw material required for each item. Consistency will be implemented, such as the amount per item. As a result, they will have a simpler time checking the system and producing that thing [9].

Norijah's Bakery had several problems and failures with its manual inventory management, including unstructured business flow, product rotting, and data loss. The system was created to help the business owner streamline processes while simultaneously ensuring the protection of the company's assets. The system also provides a fantastic user experience when viewing and using the system's interfaces [10].

For the bakery to maximize its profits, it must achieve two difficult objectives: Maximize output while lowering labor costs. The bakery's productivity is defined as its ability to produce more bread with the lowest incomes possible. Increasing productivity, for example, means the bakery is making each additional bread with fewer resources and waste. Efficiency considers not just how efficient the bakery is, but also if it will handle all parts of the store after the manufacturing process is over. The wages and perks that the bakery pays workers for labor services are referred to as labor costs [11].

Food, including fast food, bakery, and vitamins, is one of the most popular things sold online. Customers can fast get their favorite cuisine without having to leave the house. However, the majority of existing online meal ordering systems continue to have flaws in terms of order notification and delivery service [12].

The bakery owner acts as the system's administrator and has total control over the database and web application's performance with this sort of system. Adding, updating, or removing items, uploading product pictures, adding or amending product categories, reviewing consumer order data, sending email and SMS notifications, altering order status, printing receipts, and viewing a list of registered customers are all options available to administrators. The bakery management system was created using culturally appropriate visuals and symbols rather than text and numbers to help ensure the bakery's long-term viability. These systems are being used; they can help tiny, informal enterprises stay afloat in their day-to-day operations. One of the primary pillars of engineering is to improve the general population's level of living by inventing tools to assist those in need. This pillar is strengthened by developments like these [13].

2.2 Name of Information System

Bakery Management System (BMS)

It enables owners to keep track of their records in one location, making them easier to handle and reducing the chance of mistakes. All product information is stored, employee information is handled, product searches are quick, direct input is provided, and inventory is created and managed. This makes everyone's everyday activities smoother, clearer, and faster.

2.2.2 System Functionality

- Point of Sale (POS)
- Manufacturers chargeback
- Inventory tracking
- Inventory management
- Order integration and management

2.2.3 System Architecture

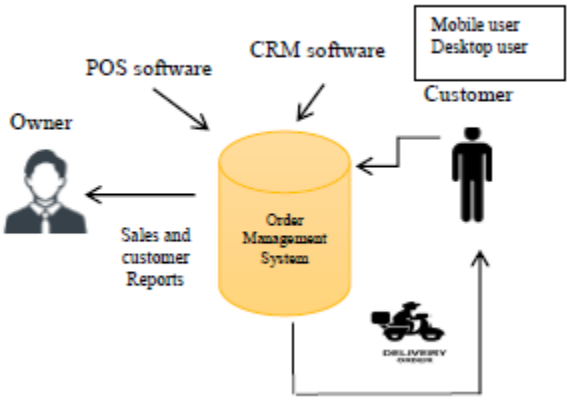

Figure 4: System Architecture of the Bakery Management Systems

Figure 4 shows a system that will allow customers to place their orders online and will be directed to the management system of the bakeshop. This system will use POS software to record the product of the bakeshop as well as conducting sales. Also, the CRM software will be part of the system to strengthen the customer relationship.

The bakeshop will make use of online applications in gathering the customer's order and address. It will eliminate the manual data entry as the customers are placing orders themselves, selecting from the product options. The bakeshops' dashboard will show all the incoming orders as well as the accurate address of each customer for delivery.

2.2.4 Cost Structure

Table 3: Cost Structure of Berna's Bakeshop

Cost Description	Cost
Operational Cost	Php57, 000.00
Maintenance Cost	Php50, 000.00
Manpower Cost	Php30, 000.00
Total Cost	**Php137, 000.00**

PROPOSED IT INFRASTRUCTURE AND PEOPLEWARE

3.1. Proposed Computer Hardware

The researchers proposed this computer hardware for the company that will help in Encoding orders, keeping documents, and do other business-related activities.

Desktop Computers

Computer speed up the trade forms and frameworks with the best quality and offer assistance in research, production, distribution, marketing, information capacity, workers administration and exceptionally supportive to extend the efficiency in lower taken a toll, less time with the tall quality it also makes a difference to communicate quickly with the client by utilizing the web, online communication instructions, and web phone frameworks. A business big or small to have a computer for them to ensure the fast service and safety of the files.

Android Cellphone

A cellphone that allows you to store data, pictures, and text. This enables you to carry files around wherever you go, ensuring that you are always with important documents for the delivery, to make customers record updated, identify the location of the costumer using the location App., and use in communication between the owner to supervisor, supervisor to employee, and employee to costumers.

Table 4: Proposed Computer Hardware for Berna's Bakeshop

Computer Hardware	***Specification***	***Unit Cost***	***Quantity***	***Total Cost***
Desktop Computer Set	*A. Brand name: Dell OptiPlex 7480* **CPU:** 2.9 GHz Intel Core i7-10700 8-Core (10th Gen) **Memory Type:** 2933 MHz DDR4 **Processor:** 10th Gen Intel Core i7 8-core **RAM:**16GB of DDR4	Php 86,208	1	Php 86,208
Samsung galaxy a11 dual-sim sm-a115f/ds	**System:** Android **Processor:** Octa Core / 1.8 GHz **Memory:** Internal: 32 GB / RAM: 2 GB or 3 GB (See Version Above) / Slot type: microSD / Max. slot capacity: 512 GB **Display:** 6.4" / HD+ Infinity-O Display / Resolution: 1560 x 720 pixels **SIM card:** Type: nano-SIM / Slot: Full dual-SIM (SIM 1, SIM 2, microSD)	Php 7,684.99	4	Php 30,739.96

3.2 Proposed Operating System Platform

The researchers proposed Operating System that is familiar, fast, secure, and can support software application.

Windows 10

A Microsoft operating system for multiple devices, such tablets, desktop computer, and other internet things devices that offers built-in security and applications.

Table 5: Proposed Operating System Platform for Berna's Bakeshop

OS Platform	System Requirements	Unit Cost	Quantity	Total Cost
Windows 10	**Processor:** 1GHz **RAM:** 1GB for 32-bit or 2GB for 64-bit **Hardware disk space:** 16 GB for 32-bit OS 20GB for 64-bit OS **Graphic card:** DirectX 9 or later with WDDM 1.0 driver **Display:** 1024 x600 or above	Php 12,000.00/ Installation	1	Php 12,000.00/ Installation

3.3 Proposed Enterprise Software Applications

Enterprise software applications are tools that are used to effectively run the business. They are designed to assist and manage an organization's whole business processes as well as address problems in a business.

Point of Sale System

Purchase orders can be generated, sent, and received via a point of sale system. It also allows store owners to manage reporting and inventory with sales/inventory data and thorough analytics.

Customer Relationship Management System

This business software assists the company in dealing with customers; it works by providing a crucial overview and details about possible clients and consumers, making contact with them, and creating chances. It will integrate sales, marketing, and as well as customer support and help the business to gain customer satisfaction.

3.4 Proposed Data Management

The proposed data management of the researchers are the following; designing database, design process identifies, normalization. Designing database conceptual (logical) design was an abstract model from a business perspective and physical design which how data is arranged on a direct access storage device. They can easily navigate to choose their orders and identify their specific orders and monitor their delivery specifically and also monitor their daily total sale according to the stocks availability.

Table 6: Data Management of Berna's Bakeshop

Data Management	Specification	Unit Cost	Qty	Total Cost
Designing database	Data arranged on a direct access storage device.	Free	Free	Free
Design process identifies	Relationships among data elements, redundant database elements and most efficient way to group data elements to meet business requirements, need of application programs.	Free	Free	Free
Normalization	To minimize redundant data elements and awkward many-to-many relationship.	Free	Free	Free

Overall Data Management Cost	**Free**

3.5 Proposed Network and Telecommunication

In business, communication is a must. It is important to share information and reaching out the customers queries and orders not just in local but also in global. The telecommunication allows us to interact virtually to the rightfully suppliers and valued customers. Through telecommunication and networking, a business can surely have an effective interaction between the owner and customer on dealing the correct orders and supplies.

Router- it is a piece of network hardware that allows communication between your local home network—like your personal computers and other connected devices—and the internet.

Switch- Switches connect network segments, providing full-duplex communication, valuable network performance data and efficient use of network bandwidth.

Internet Connection- the Internet is a global wide area network that connects computer systems across the world. In the world of business, internet connection is one of important things that the business should have. Having an internet connection that is faster than other is such an advantages of this business where it uses in the specific task such as inventory, marketing and communication.

Table 7: Proposed Computer Hardware for Bernas Bakeshop

Computer Hardware	Specification	Unit Cost	Quantity	Total
Router	Tp-Link Archer AX50 Mu-Mimo AX3000 Dual-Band Wifi 6 Router	₱5,700.00	1	₱5,700.00
Switch	TP-LINK SF1008D 8 PORT SWITCH HUB (10/100MBPS)	₱550.00	1	550.00
Internet	Converge ICT Solutions	2,500 Installation 1,599/month	1	4,099.00
Overall Data Management Cost				₱10,349.00

3.6 Proposed Internet Platform

The internet platform acts as a middleman for information and contact flows. It also gives customers more options and flexibility, improves market quality and competition, and can boost civil engagement.

E-Commerce

It involves the purchase and distribution of goods or services over the internet, as well as the conversion of funds and records to complete the transaction. Electronic trade, or online commerce, is another name for it.

In our fast-paced world, e-commerce provides flexibility that was previously inaccessible, allowing customers to buy at Berna's Bakeshop from the comfort of their own homes. This allows Berna's Bakeshop to expand by providing a diverse choice of items to their clients in today's competitive and efficient culture. E-commerce can offer up many routes for conventional bakeries as more consumers become accustomed to purchasing goods online.

Online Advertising Platform

It aids in the identification of potential customers, especially those who are more likely to be involved in what you're selling. Digital advertisement platforms like online display advertisements, social media ads like Facebook and Twitter ads, and video ads make it possible to meet your target demographic.

Berna's Bakeshop will benefit from the availability of an online advertising platform since it will increase its online visibility, making it easier for consumers to locate it. A website is an excellent marketing tool that will help the bakery brand gain visibility, exposure, and reach new heights. Berna's Bakeshop's website should provide the customers the opportunity to highlight their specialties, menu, and services.

Table 8: Proposed Internet Platforms for Berna's Bakeshop

Internet Platforms	Specification	Unit Cost	Quantity	Total Cost
E-Commerce	It allows consumers to place orders over the internet	Free	1	Free
Online Advertising Platform	A marketing and advertisement platform that sends promotional marketing messages to customers via the Internet.	Free	1	Free

3.7 Proposed IT Manpower

IT Manpower plays a critical role in maximizing human capacity and assisting workers in improving company efficiency as well as their experience, expertise, and abilities.

Manpower Development

- Training
- Education
- Knowledge
- Skills

Software Developer

It can assist in the development of internal programs that can assist businesses in being more competitive in the production of systems that can benefit the business.

Table 9: Software Developer for Berna's Bakeshop

IT Manpower	Specification	Unit Cost	Quantity	Total Cost
Software Developer	Develop and maintain software programs.	₱ 275,078.56	1	₱ 275,078.56
Total Cost				**₱**275,078.56

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Berna's Bakeshop is a successful and leading bakery in Malagamot Area currently residing in St. Vincent Ilang, Davao City, Davao del Sur, manages by Noel D. Berna's with the help of his brother Nilo Jr D. Berna's; Berna's Bakeshop is a single branch. Base on the findings, the study concludes that Berna's Bakeshop needs a system that will aid their routines and promotes business process efficiency. We discovered on how they handle client orders, inventories, and deliveries. Our system will aid their business routines in a more efficient and timely manner. The business will benefit as a result of this; they will attain operational brilliance, resulting in significant profits. Bakeshops are difficult to manage, especially when employing manual procedures to handle significant business activities. However, with the right systems in place, trust, support, and hard effort will eventually pay off. We are grateful that they allowed us to conduct a study in this type of business. We hope that this will provide them with an excellent opportunity for the bakeshop to grow.

4.2 Recommendations

The following are recommendations the researchers suggest for Berna's Bakeshop to consider;

1. To upgrade the hardware components of their
2. Computers for faster processing.
3. Ensure that the computer system's operating system to newer versions of windows for the system to continuously receive updates.
4. Create Automated Daily Time record System.
5. Berna's Bakeshop proposed to improve their way of recording their data and communication.

This system will have a positive impact on the business, will organized, and intact the file in one place.

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