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Analysis of Open-Source Solution for Point of Sales Inventory Management System

Joxel Marico[1], James Purnama[2], Maulahikmah Galinium[3]

joxel.marico@student.sgu.ac.id[1], james.purnama@sgu.ac.id[2], maulahikmah.galinium@sgu.ac.id[3]

Faculty of Engineering and Information Technology, Swiss German University[1, 2, 3]

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Abstract

Package other popular food distributor businesses. To gain advantage, they used newest Point of Sales (POS) for their business. POS allows user to do transaction between buyer and cashier, manage stock, etc. Unfortunately after several months, their business closed down, because the newest POS is not designed for their food distributor. ,The purpose of this research is to understand how POS would affect the business and why POS is valuable and important for business. The goal of this research is to find out which POS is suitable for both small and large business. There are four open-source POS to be analyzed, which are Odoo, E-hopper, Loyverse and Aronium. fOr Comparing Open Source software Evaluation Methods (FOCOSEM) is used to compare their features. In conclusion, only one shop. If the business owner wants to open another shop at different location but he/ she wants to keep track another shop, E-hopper or Loyverse is recommended. If the business owner wants to use mobile devices for easy setup, Loyverse is recommended. If the business owner prefers using PC, then E-hopper is recommended. For business owner who is conducting export and import then Odoo is recommended.

Keywords: open source; Point of Sales (POS); inventory system, Focosem

I. INTRODUCTION

Everyday packaged food always distributed by some companies to other cities and small towns . To improve their food sales and business, business owners use POS that allows them managing transaction, employee, stock, payment, etc. Because of this reason, POS becomes popular and sets as a requirement to open their business. However, after several months, the business went down because the POS they are using has a lot of problems that affect their business. The problems included large amount of stock could not be handled and tracked, it is

difficult to resupply the stock properly, it is difficult to understand, to use, and to set, POS interface is too complicated, some POS features are not needed by the business owner such as specific price for customer who have bought their food long time ago, and many more. The purpose of this research are :

1. To determine the best POS which meet the business owner need,.
2. To understand each feature and function of each POS including their advantage and disadvantage to find which POS meet what business owner require.
3. To recommend which POS is best match based on their location and type of business.
4. To understand specification of each POS for business owner need

The four POS are chosen because they are recommended to be used in multiple location, market, few transactions etc. In addition, their interface is more reliable and understandable. The POS open-source are Aronium, Odoo, E-hopper, LoyVerse.

II. LITERATURE REVIEW

"FOCOSEM" is a table Designed by reference [1] as a systematic comparison of open-source software (OSS) evaluation methods. The purpose of using the table is to understand the main framework and select suitable OSS evaluation method as also used by reference [2] and [3]. The FOCOSEM table is described in table 1.

Table 1. FOCOSEM: a Comparison Framework for OSS Evaluation Approaches

Component	Element	Brief Description
Method Context	Specific goal	What is the particular goal of the method?
	Functionality Evaluation	Is functionality compliance part of evaluation method?
	Result publicly Available	Are evaluation of OSS product stored in a publicly accessible repository?
	Relation to other method	How does the method relate to other method? I.e. what methods was this method based on?
Method User	Required skills	What skills does the user need to use the method?
	Intended users	Who are the intended users of the method?
Method Process	Method activities	What are the evaluation method's activities and steps?
	Number of criteria	How many criteria are used in the evaluation?
	Evaluation Categories	What are the method's categories of criteria based on which the OSS product is evaluated?

	Output	What are the outputs of the evaluation method?
	Tool support	Is the evaluation method supported by a tool?
Method Evaluation	Validation	Has the evaluation method been validated?
	Maturity stage	What is the maturity stage of the evaluation method?

Odoo [4] is a business management open-source software tools that designed for user need such as e-commerce, billing, manufacturing, stock management, project management, inventory management, warehouse, accounting, etc. Odoo also has built-in cashier. Odoo can be accessed from any devices which give flexibility but it required internet connection. Odoo has a function called loyalty program which allows the customer to earn points every time they purchase something from merchant using Odoo. References [5][6] also use Odoo in their research related to small medium enterprise.

E-hopper is a separate database and POS software which allow business owner to manage their product, transaction, and others with browser on different PC/ mobile device at any time, but it required internet connection. POS installed on different PC can be only accessed by business owner PIN and employee PIN. To apply the setting, the POS program requires internet connection to synchronize the owner settings. Aronium is another free POS software which is designed for small restaurant or small business. Aronium purposely designed to be easy to use, modern, and reliable. This POS is supported by Windows and older version. Loyverse [7] is a POS that run on Android. It doesn't contain many features like other POS. It has only 3 features, employee, cashier, also product and history. Manage product and review statistic feature can be accessed only by business owner while employee can only access cash and receipt., To sees back office, business owner must use browser.

III. RESEARCH METHODS

The first stage of this research is problem analysis. It is done to find out reasons how the current POS affects their business. The analysis starts by looking at situation of their business, their POS, and their need. Most problems happened because either the business is not properly managed, or the POS does not fulfil what the business owner need , the POS they picked is wrong, or the POS has problems. The second stage is literature review. At this stage, all definition and other research findings on business and POS are reviewed. This would help researcher to understand the concept and 4 selected POS better.

The third stage is searching for right Open Source Solution (OSS). Researcher look for alternative POS to replace current POS that is more reliable and easier to use then select -5 POS program based on business owner need analysis. The fourth stage is conducting experiment. On this stage, the researcher conducts experiments on all POS at the same time such as installing

and testing all POS features and functions . This stage is important to make sure the POS works properly without bug and fulfils needed criteria.

The fifth stage is comparison analysis. During the analysis, all POS features and functions including its advantage and disadvantages will be recorded on notepad or excel. Once it is done, the result will be compared to other POS. The sixth stage is getting feedback from business owner. After getting the business owners trying different selected POS, the owners are requested to provide feedback either positive or negative on each POS. The purpose of this activity is to find the most suitable POS for their business and their employees. The feedbacks then will be used on seventh stage. The seventh stage is finding suitable solution. This section can be determined from business owner feedbacks, research analysis, and business owner criteria. If research analysis could not come with satisfied business owner criteria, then the stage should be returned back to “Searching for open-source solution”. The last stage is recommendation. Once the the business owner criteria have been fulfilled, this research can be concluded. These steps are illustrated in Fig. 1.

The tools and equipment used in this research is a laptop with specification i7 6700HQ, 16 GB ram, 2 hard disk (1 TB and 250GB), and with updated window 10. For recording all POS during experiment, Microsoft Excel is used. Virtual box will be necessary for POS which can be run on Linux. The POS also will be run on laptop without using internet since POS will be installed without internet provided.

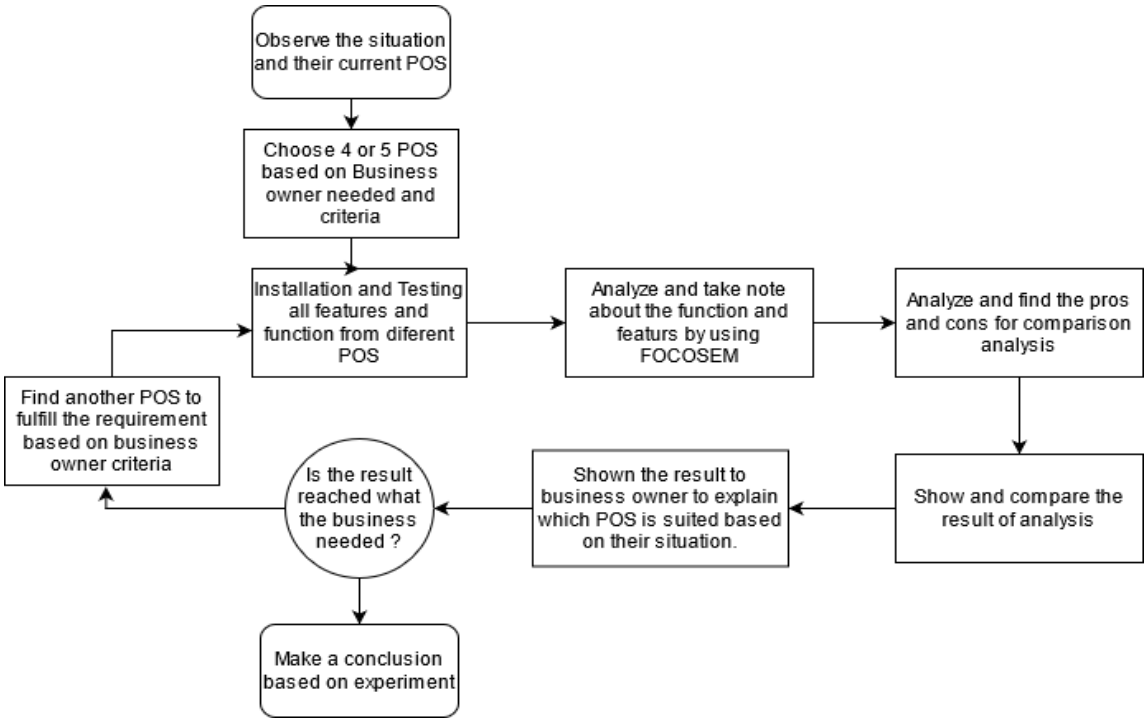

Figure 1. Diagram of experiment design.

During experiments, the researcher observes current POS utilization and situation to find the right POS for the business owners. The researcher will also ask what kind of POS features that are needed by business owners. Once the business owner need are recognized, the researcher will select four POS that meet business owner requirement.. The selected POS are installed and tested to make sure the POS do not has issues during demonstration. While demonstrating all POS features and function, the researcher recording then analysing the data using FOCOSEM table which make the comparison more flexible and reliable. The PROS and CONS of each POS, are written on different tables.

After analysing the POS using FOCOSEM, the researcher shown the result including PROS and CONS of each POS to the business owners. It will allow them choosing the best POS for their business. If none of selected POS is chosen because they do not meet what business owner need, the researcher has to find alternative or another open-source POS then analyze it. If the business owner chooses POS that meet their criteria, the researcher will make a report based on the experiment and analysis. On comparison analysis section, the result of POS feature and function analysis including their advantage and disadvantage (PROS and CONS) will be used by the researcher and the business owners to reconsider the best POS for their business. The results whether it is good or not will prevent the business owner for using wrong POS that is not suitable for their business and plan.

On interview section, the business owner will be interviewed to get feedback after they choose one POS and use it for one week. The feedback will be useful to find out whether the business owner is satisfied with his new POS or not. The feedback will also be useful to improve this research and researcher' knowledge. Below are questions that are used for the interview:

1. Does your new POS meet your criteria and your requirement?
2. Is your new POS more reliable, easier to manage, and easier to use than the old POS?
3. If you have plan to open another business on another location which POS do you want to use or recommend?

The feedback can be used to set another criteria or requirement to find another POS apps in case the selected POS has bug or problem.

IV. RESULTS AND DISCUSSIONS

To analyze advantage and disadvantages from all selected POS, PRO AND CONS table is created. Table 2 shown that each POS has advantages and disadvantage. This allows the researcher and the business owner to discuss and reconsider finding suitable POS for their current situation. Some POS are not designed for tracking employee when opening another shop on other location. This can be serious problem as the product and transaction data could be manipulated by employee. To prevent this problem, another POS is required to have employee

account and employee and transaction tracking features. Some POS should be installed such as Aronium, Loyverse, and E-Hopper, while some other POS do not need to be installed such as Odoo which can run on browser only.

Table 2. POS PROS and CONS comparison table

POS Software	Platform	Internet requirement	Manageable from different devices (PC or mobile)	Built-in one	Installation requirement	Setup difficulty	Business suitability
ARONIUM	PC	Offline	No	Yes	Yes	easy	medium
ODOO	PC	Online	No	Yes	No (POS in Browser)	hard	small
E-HOPPER	PC	Offline	Yes	Yes	Required to install POS program only	medium	big
LOYVERSE	Android	Online	Yes	No	Through Google play	easy	big

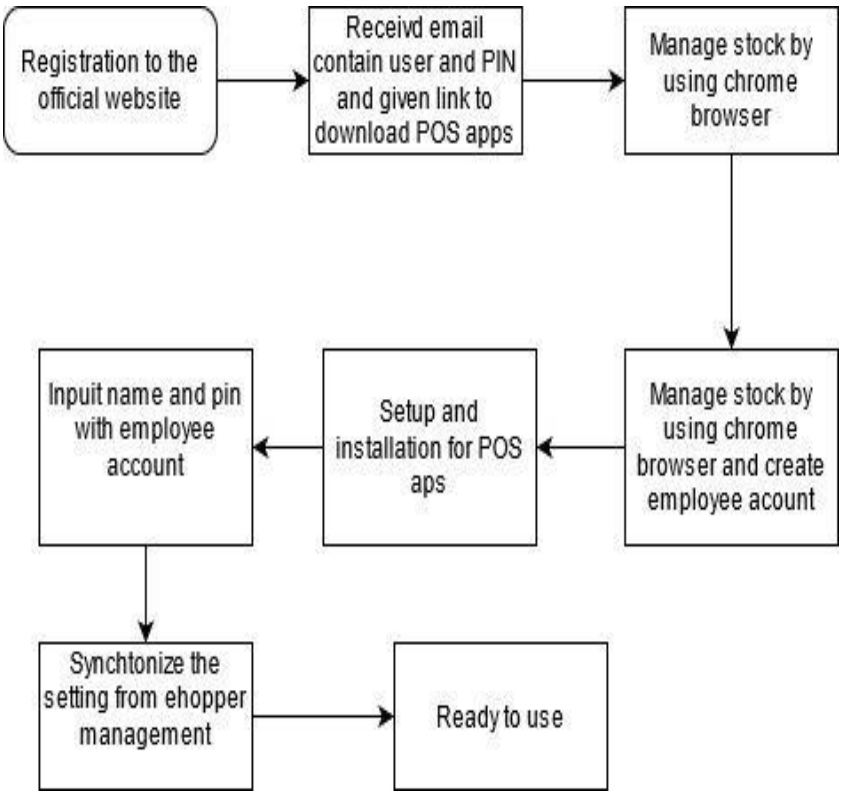

Figure 2. E-Hooper installation diagram

Fig. 2 shows that E-hopper has 2 programs, one is database management and setting and another one is POS sales. This POS allows the business owners managing their databases, having cross platform with any devices, and accepting payment cards. This allows the business owners manage their business without being detected by employees. The E-hopper supports any operating system and cross platform which give huge advantage. The downside is the database can be opened/accessed by any OS that can run Chrome browser. It will refuse to open if another browser is used.. The management setting can be applied into POS setting by sync the POS apps. To do this, internet connection is required to sync the setting.

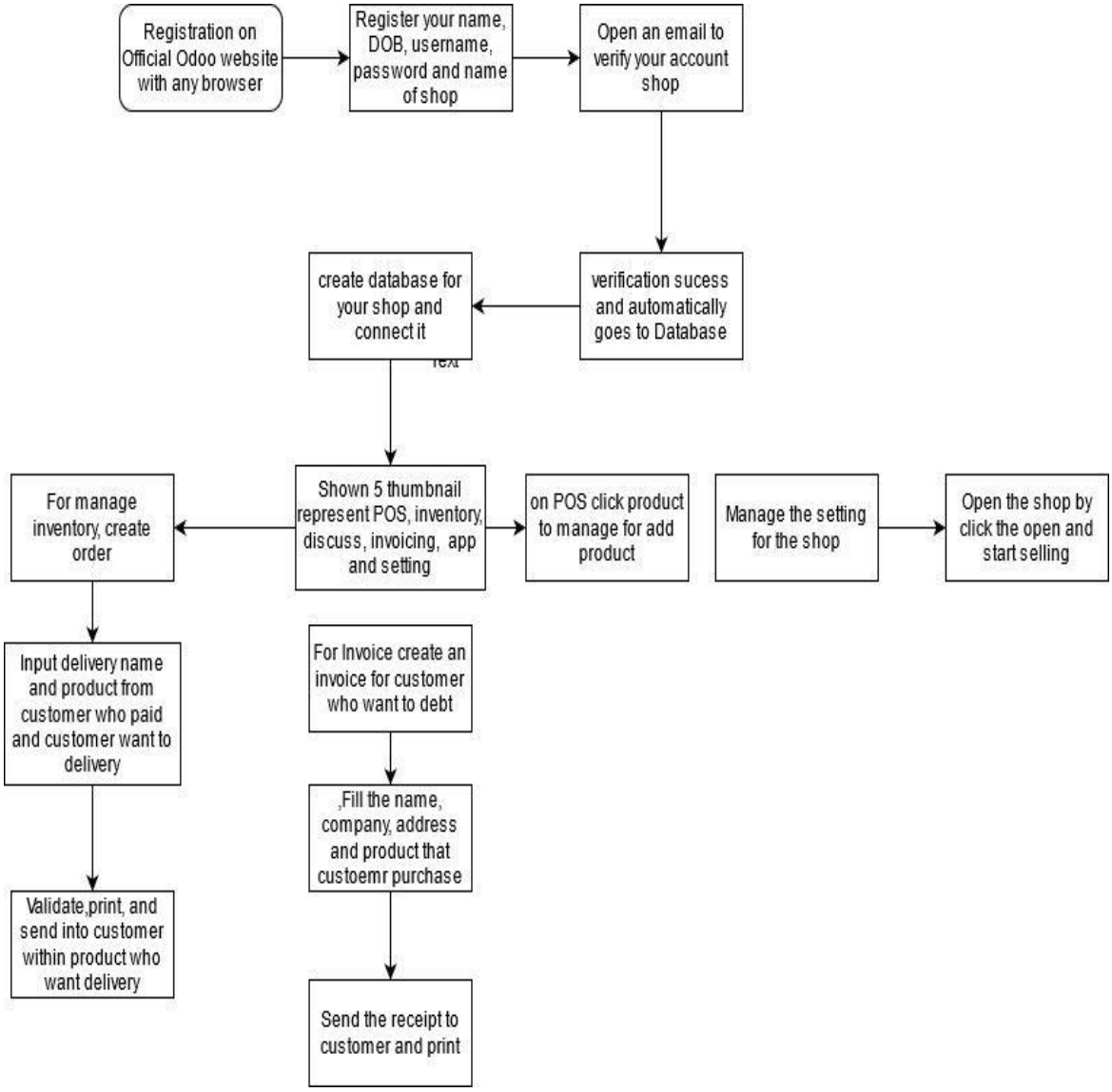

Figure 3. Odoo diagram

Unlike E-hopper, Odoo does not need to be installed. It operates on any browser and any devices. Odoo provided 5 menus: POS, Inventory, Invoicing, Apps, and Setting. Inventory is used for managing stock, of incoming and outgoing products also for creating an order for customer,. The downside is it required internet connection. If the internet is down, Odoo can't be accessed and used which is not reliable. Fig. 3 shows how Odoo works.

Aronium can be downloaded and installed from official Aronium website as illustrated in Fig. 4. Once it is downloaded and installed, the business owner should register to access Aronium with an email. Aronium provides tutorial for new user to understand its features. The tutorial is simple and easy to understand. This could make the Aronium is good for new user who want to open shop for the first time.

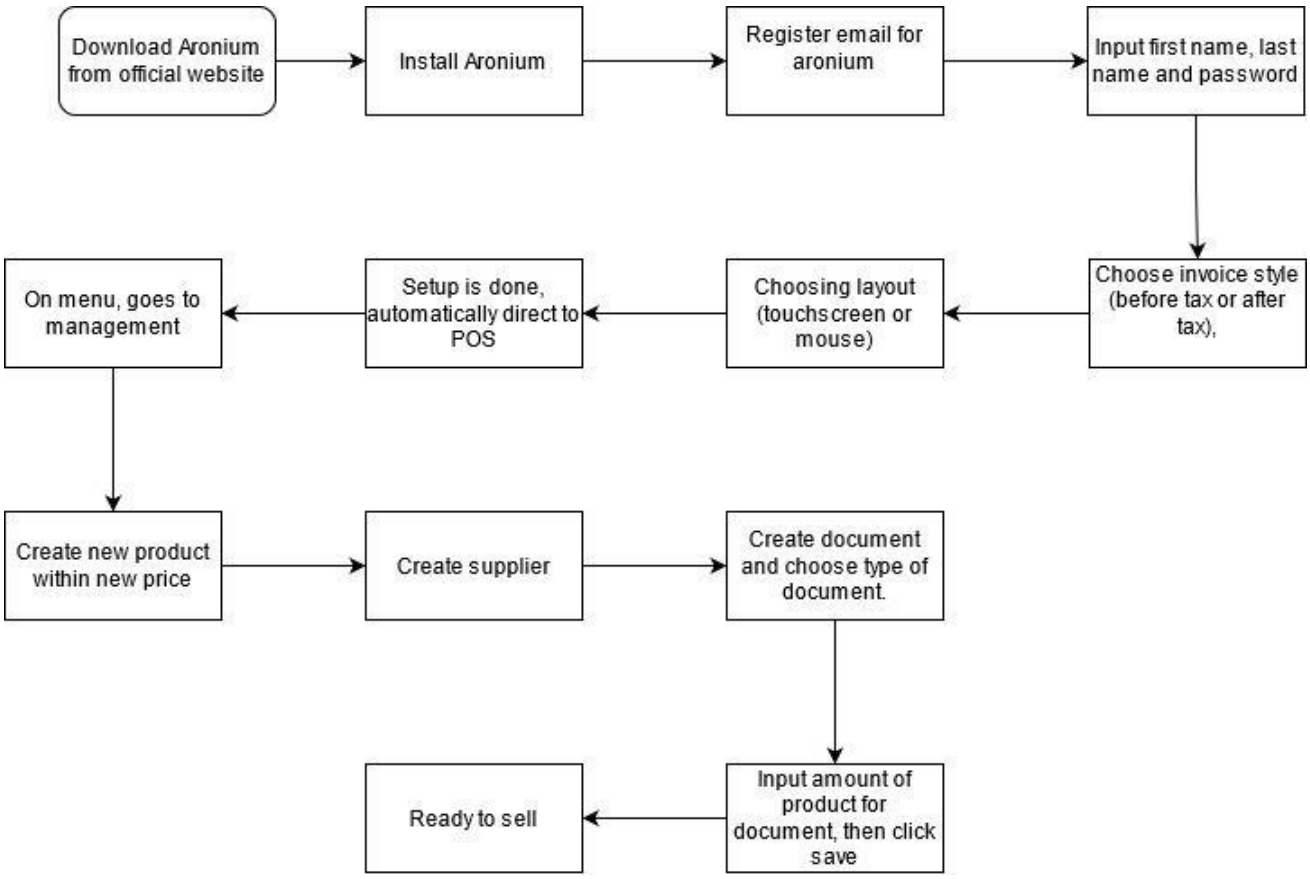

Figure 4. Aronium installation and setup diagram

As shown in Fig. 5, Loyverse is a POS that can be operated with Android only, It is an app with simple layout and interface to allow user knows how to use it instantly. Unlike Odoo and E-hopper, Loyverse capable to add/edit product without closing the POS., Loyverse provides a dashboard to show sales result and business tracking. Loyverse provides a link to back office.

This back office contains similar features to dashboard plus receipt and item management, inventory management, customer, integrations, employee, employee roles, and settings. These features allow the business owner to set multiple POS on different location and shops. The downside is some features need premium access such as adding employee. Loyverse offers 14 days free premium trial to try these features. The second downside is it requires internet connection to access. To solve this problem, Router with quota is recommended.

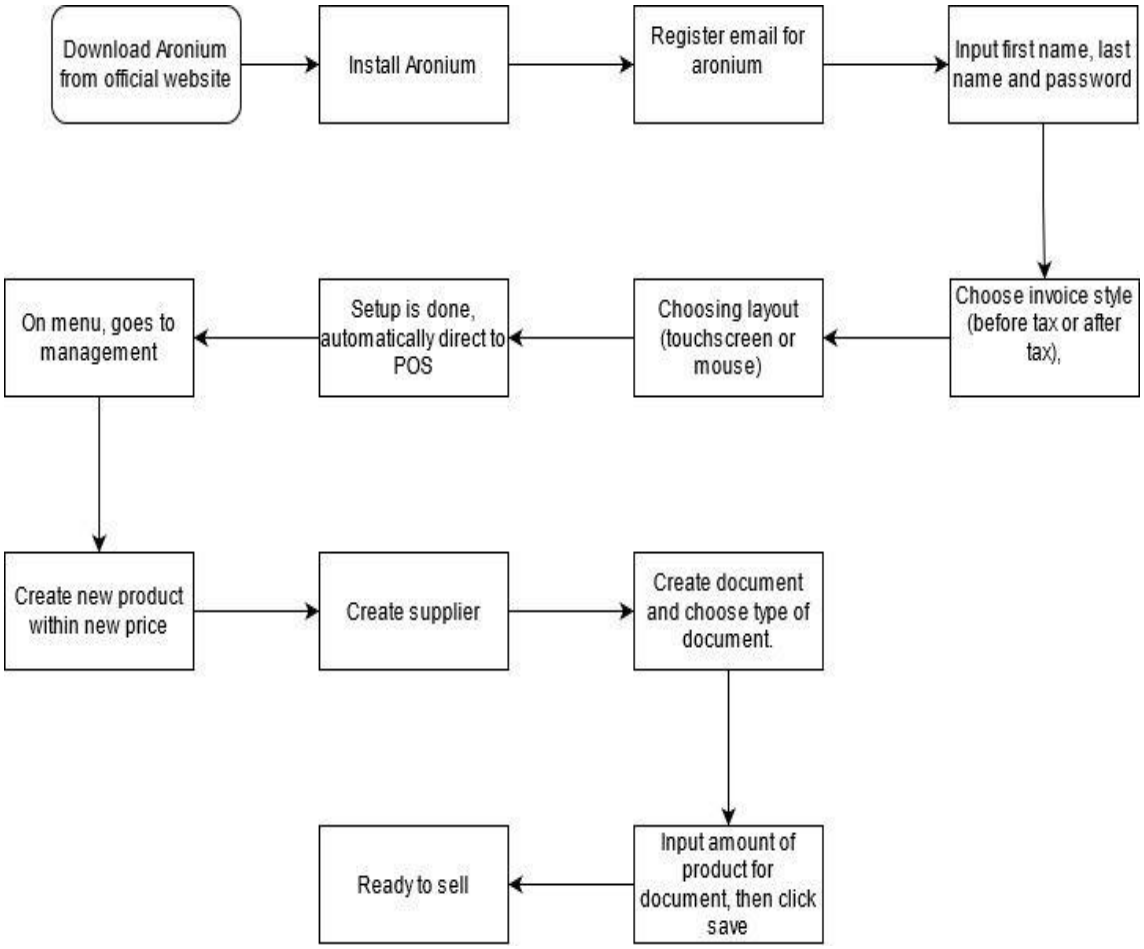

Figure 5. Loyverse diagram

After trying all POS software while testing at the same time, an analysis using FOCOSEM is carried out as described in Table 3. The result is interesting. Some POS used Cloud POS and some POS did not. Each POS has different goal, one POS aim to make life easier, while another aim to reduce and reuse amount of resource required to run the business, and more. Each functionality evaluation has different results. This shown that POS can be preferable for specific business. For example, Odoo is designed for accounting project, email marketing, invoicing, and doing inventory; E-hopper is designed for food shop such as restaurant, café and bakery shop;

while Loyverse is designed for flexible shop like stationary, cracker, and food. Result publicity is a result statement from each POS' official website. Unfortunately, the result publicity could not be accurate because the number of POS apps user is keep growing. Therefore, the official statement from official website is used, but some only provide country data only like Aronium.

V. Experiment and Analysis

Table 3. FOCOSOM Analysis in Four Open-Source Software

1	Business Requirement - Case Study	Analysis Alternative 1 - Odoo	Analysis Alternative 2 - E-hopper	Analysis Alternative 3 - Loyverse	Analysis Alternative 4 - Aronium
2	Method Context – Specific Goal	To provide software that is intuitive, full-featured. tight integrity, effortless to upgrade, running smoothly for every business and every user.	To decrease amount of business resource required by the owner, overhead and re-use management, and employees to increase sales and improve the business.	To turn your tablet and smartphone into POS and manage the POS, employees and sales without having issue, handle customer and increase sales and business.	To make the Retail easier and reliable.
3	Method Context – Functionality Evaluation	CRM, POS, Sales, Website Builder, E-commerce, Invoicing, Accounting, project timesheet, helpdesk, email marketing, inventory, MRP, purchase.	E-hopper use two side POS, one is for POS, one is for management such as stock, history, transaction, settings and more. This method allows the business owner access the database to manage with other devices anytime.	The cloud based POS can be used in any store like retail store, restaurant, coffee shop and other groceries store.	These functions are simple and easy to recognized by the users. This allows to user understand, although to access the management is a bit difficult to find. Aronium provided the tutorial to use it. Aronium is similar to Odoo
4	Method Context – Result publicity	Yes exist, 1550 employees, 7 million users.	No mention in E-hopper.	"Over 1,000,000 businesses in 170 countries have registered and it is available in 30+ languages".	Only mention " More than 40 Countries every day."
5	Method Context – Availability	support any OS but it requires browser and internet connection to operate.	support any OS to install POS apps only, Database Management support Chrome only.	Run on Android only through Google play.	Support Window 7, Window 8 and Window 10 and touch screen mode.
6	Inventory – Type of Goods	Support any goods such as fruit, vegetable, beverages,	Support restaurant, Vape shop, bar shop,	Organize item with a custom price, description and	Stock management is simple, grouping the products,

		coffee but it is not designed for opening store like bar, restaurant and café.	bakery store, retail store, food truck.	photo, rearrange product into categories	searching products with barcode, SKU or products name, view product history, and inventory
7	Inventory – Stocks	Shown on-hands, forecasted, product moves and available quantity.	Restaurant, Vape shop, bar shop, bakery store, retail store, food truck.	Similar to E-hopper, Loyverse can be used for any POS.	Through management, the owner can view the result of sales and transaction.
8	Cashier	Accept Bank transfer or cash	Restaurant, Vape shop, bar shop, bakery store, retail store, food truck	Support cash and digital payment such as SmartPay, KICCM, TYRO, PAYGATE and Sums-Up	Cash, Credit Card, Debit card, Check, Voucher, Gift card, and Split payment
9	Transaction Tracking	Order, sessions, payment	It can be check on POS apps on orders history. On back office, the E-hopper tracked and showed the tracking on dashboard.	All transaction analytic can be viewed on separate apps	It can be viewed by looking on sales history, top products, etc.

Availability is what kind of operating system required to run on, such as mobile devices (tablet or smartphone) or PC. This availability depends on user preference. For example: User A wants to open business and prefers using PC so User A should choose POS that is operated on PC while User B prefers mobile devices like Android or Apples so user B should choose POS that run on mobile devise. Although POS can sell any goods but some of them are not designed for that function, for example, Odoo. Odoo is good for storage management and invoicing, but when it is used to sell some foods, it does not sell properly because it needs additional setting. The interface is not designed for that. In contrast, Aronium is suit for selling some goods including foods because Aronium's interface is designed for selling foods. The last one is Stock. Stock is the amount of selling goods stored in a shop or a storage. Stock can be run out during sales. Therefore, to prevent miscounting, stock tracking is important. Stock tracking can track accurately how many goods are on the shop, and warn the business owner when the goods are running out. On some POS, stock tracking feature must be set first in order to work properly. When the stock tracking is not accurate, it can affect business. Loyverse and Aronium are perfect for this because these POS are easy to setup and reliable.

VI. CONCLUSIONS AND RECCOMENDATIONS

The research concluded that most of packaged food business prefer using PC platform to Android/ mobile devices. The reasons are PC is mostly used on business and it is easier to manage transaction, search products that customer want, and manage database and stock. In the other hand, Android/ mobile device is preferable for back office. The reasons are Android is flexible and easy to use, and it can be used any time and any place. The business owners can check and manage their sales, stock, and transaction, at any time.

If the business owner would like to open a shop which does not require internet connection, Aronium is good for solo shop. If the business owner would like to open another shop at different location but still want to keep track of the current shop, E-hopper or Loyverse are recommended depend on what devices they are using. If business owner would like to use mobile devices for easy setup, Loyverse is recommended. If business owner prefers using PC, then E-hopper is recommended. Then, if business owner prefers doing delivery such as export and import then Odoo is recommended.

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