

ENGINEERING SUPPLY INFORMATION SYSTEMS BY APPLICATION OF THE METHODS OF ECONOMIC ORDER QUANTITY (EOQ) AT THE SUPERMARKET (CASE STUDY: SAHABAT KITA SWALAYAN)

Aini Istiqomah¹; Istianah Muslim²

¹Program Studi Sistem Informasi
Politeknik Caltex Riau
<https://pcr.ac.id/>
aini@alumni.pcr.ac.id; istianah@pcr.ac.id

Abstract— Sahabat Kita Swalayan is a supermarket located in the city of Bangkinang. The supermarkets have some of the drawbacks of sales, purchases, and supply systems. The frequent losses at this market are due to overstocked and stocked stores. The market also has no record of sales and purchase, so there is no accounting for obvious items. Furthermore, the supermarket owner who makes reservations to the supermarket by mere estimates fails to notice the supply. That way, the stock in the cellar will be overstocked and out of line with the proper sales target. To know the optimum number of purchases and the exact time of repurchase of goods, a system of supply was developed using a method of the economic order quantity (EOQ). The method of the economic order quantity (EOQ) was used to identify the number of ordering optimum stock items. By using reorder points (ROP), it can define the limit of what is in store. Furthermore, the system uses the single exponential smoothing method to predict sales figures. The study led to an undeveloped supply information system that can be implemented in the process of our friend's supermarkets that can be used by the supermarket owner and employee. It is hoped that because of this system, it is possible to help supermarkets maintain pen control.

Keywords: Sahabat Kita Swalayan, Economic Order Quantity (EOQ), Reorder Point (ROP), Single Exponential Smoothing.

Abstrak— Sahabat Kita Swalayan merupakan sebuah swalayan yang berlokasi di Kota Bangkinang. Swalayan ini memiliki beberapa masalah kerugian yang terjadi pada sistem penjualan, pembelian, dan persediaan barang. Kerugian yang sering terjadi pada swalayan ini disebabkan oleh kelebihan dan kekurangan stok barang di gudang. Swalayan ini juga tidak memiliki catatan data penjualan dan pembelian sehingga tidak ada kejelasan perhitungan pada stok barang. Selain itu, pemilik swalayan dalam melakukan pemesanan kepada supplier hanya dengan perkiraan saja tidak melihat stok barang yang ada.

Dengan begitu, stok di gudang akan berlebih dan tidak sesuai dengan target penjualan yang semestinya. Untuk mengetahui jumlah optimum dalam melakukan pembelian dan mengetahui kapan akan dilakukan pembelian barang kembali, maka dibangunlah sebuah sistem persediaan menggunakan metode Economic Order Quantity (EOQ). Metode Economic Order Quantity (EOQ) digunakan untuk mengetahui jumlah pemesanan optimum stok barang. Dengan menggunakan Reorder Point (ROP) dapat menentukan batas stok barang yang ada di toko. Selain itu, sistem ini menggunakan metode Single Exponential Smoothing untuk memprediksi angka penjualan. Pada penelitian ini dihasilkan sebuah rancang bangun sistem informasi persediaan yang dapat diimplementasikan pada proses bisnis sahabat kita swalayan yang dapat digunakan oleh pemilik swalayan dan pegawainya. Dengan adanya sistem ini diharapkan dapat membantu pemilik swalayan dalam melakukan pengontrolan penjualan, pembelian, serta dapat memamanajemen persediaan barang sesuai dengan permintaan pelanggan.

Kata Kunci: Sahabat Kita Swalayan, Economic Order Quantity (EOQ), Reorder Point (ROP), Single Exponential Smoothing.

INTRODUCTION

Sahabat Kita Swalayan is a small middle-income company that sells day-to-day needs. As for the business process, there are interrelated variables of sales, purchase, and supply. So if one of the variables blunders in the number then all variables would be compromised. Nevertheless, clerical errors were difficult to avoid (Muthia, Amalia, Puspita, & Lestari, 2019). The tendency to err is often predictive of sales figures (Al-Husaini, Zul, & Muslim, 2018), purchases, and supplies at small businesses (UKM) as is the case with our friend at the market.

That was based on an interview with the supermarket owner, Andre, on April 5, 2019. Further information obtained from the interview is

that the sale of each transaction will reduce the supply of the item, and the reduced supply would require an increased supply to make the purchase. One of the wrongs involved in the purchasing of the note-keeping was that paper (Yuniva & Hestiyanto, 2018) and notes were frequently lost (Riandy, Huliyah, & Subiyakto, 2011). This leads to excess and a shortage of goods (Yuniva & Hestiyanto, 2018) in the purchasing of incentives. Furthermore, when items from the supermarket came and were transferred into the supermarket the supermarkets could detect any item that was both good and bad, the defective would be returned to the special. So the number of purchases will be reduced and affect the future supply.

To address the problem, one way that can be used is to apply a supply information system (Riza & Purba, 2018) using accurate calculations. The calculation involves comparing methods that work best with those used in the department store. After a pre-predicted calculation of the data history of sales was made, it was the result that the most appropriate method was the method of the economic order quantity (EOQ) (Iqbal, Aprizal, & Wali, 2017), (Thinakaran, Jayaprakas, & Elanchezhian, 2019), Because it has the smallest total cost that has previously been compared to the other two methods of method Fixed Period Requirement (FPR) dan Period Order Quantity (POQ). After obtaining the quantity of the ordering of goods, the system would reorder order points again by applying to reorder point (ROP) calculations (Ryando & Susanti, 2019) Where you can see the waiting period, too (lead time) So it doesn't happen to the stockout that makes sales stop. This system will provide a reminder of the stock has reached the reorder point limit or Reorder Point (ROP). Lot's methods of filing these products can determine the number of repurchasing without the increased risk of buildup and shortage of supplies. To anticipate the stockout of one kind of item, it will also need to apply calculations Safety Stock (SS) (Danusaputra, 2018). comparisons method lot sizing, calculation Reorder Point (ROP), dan Safety Stock (SS), all these methods of calculation are chosen according to the study of literature belonging to (Nissa & Siregar, 2017) Controlling supply of goods so as not to occur deficiencies or excess products and can improve efficiency and effectiveness in terms of time and cost. Therefore, the study will attempt to construct an information system with the application of the economic order quantity (EOQ) methods of our friendly supermarkets with the need to know which items to order by the request of the buyers to prevent the unmade, Requires maximum sales value, average sales, lead time, and safety stock and as an alternative to help the

bookmakers make the reservations. This idea arose based on a problem with our supermarket friend's business process.

MATERIALS AND METHODS

A. Data collection technique

In this study using some data collection techniques as follows:

1. Observation

The method of observation is that of a researcher who goes directly into the field to conduct an interview and to verify what is going on. So the information that the supermarkets get is more accurate and accurate. At the observation stage, the authors collect data on the field of case studies.

2. Interview

In this method, researchers engage in direct question-and-answer questions by asking some of the problems associated with supermarkets' owners and employees.

3. Literature review

In this study, researchers have found sources relating to research, journals, and thus have greater value and benefit the reader.

B. Research methods

In research, the methods used are methods of Economic Order Quantity (EOQ). It helps to determine what the purchase rate is next on the button. Forecasting calculations and ROPs to support more optimal calculations.

C. System Development Model

1. System Requirements Analysis

At this stage, direct observation of case studies is made to take into account every problem. If the problem exists, it will be implemented using a supply information system to measure the usefulness of a system already created.

2. Design

This stage describes the making of the system design, database design, and user interface design.

3. Code Generation

At this stage presents a methodical language economic order quantity (EOQ) on a supply information system with a language of programming HTML by using CodeIgniter.

4. Testing

At this stage, a test of implementation of a system is already made with a testing black box and user acceptance testing (UAT). The test served to measure the usefulness of systems of features that had been built by conducting tests on supermarkets and employees for two months.

RESULT AND DISCUSSION

1. Software Requirments Analysis

Here are user needs:

- a. The need for supermarkets
Can manage sales and purchase transaction records. and can control inventory according to customer needs.
- b. Staff necessity
Can supplement sales transactions and manage data goods.

2. Design

The design gives an idea of a website that has been built to fit the user's needs. Building systems require database design and interface design.

a. System Design

The design of the system has been created using a use case diagram by the user needs of the system.

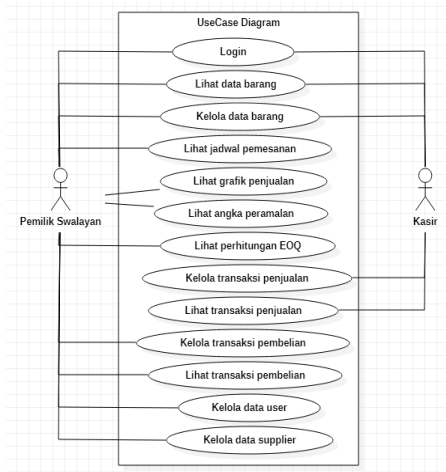


Figure 1 UseCase Diagram

Use case diagram It is used to describe the workflow and access restrictions of system users in general, for system users to understand the limits of their access and way of doing things. In the design of the case, picture 5 shows 2 actors, supermarkets, and a cashier. The design use case is also intended to describe the functions found in the system.

Table 1 Actor Identification

No	Actor	Description
1	Supermarkets	The actor with this role has the authority to manage staff and assistance, to oversee stock transactions, to manage sales transactions, to manage purchase transactions, to sales, to see EOQ calculations, fortune-telling, and sales charts.
2	Cashier	The actor with this role has the authority to see and increase goods and manage sales transactions.

b. Database Design

Figure 2 On a database design that is a data storage. Here is an entity-relationship diagram (ERD) on the supply of the information system.

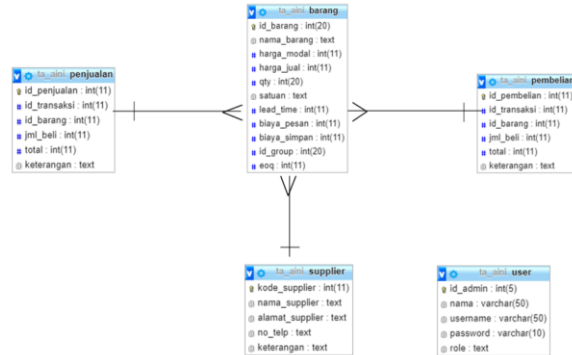


Figure 3 Entity Relationship Diagram

c. Interface Design

1) Log Page

To access the system, the user would log on, which is the first page to show up for the first time. This page will be validated against the username and passwords that were provided for by the user. The log page can be seen in Figure 3.

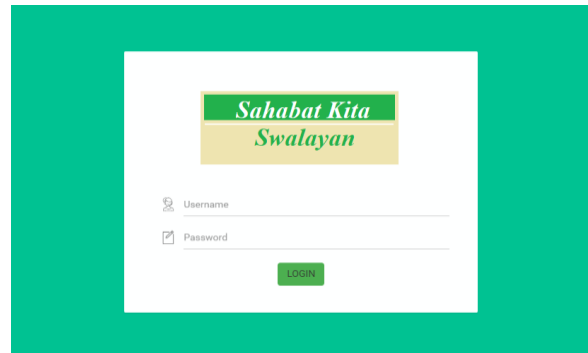


Figure 4 Log Page

2) Home Page

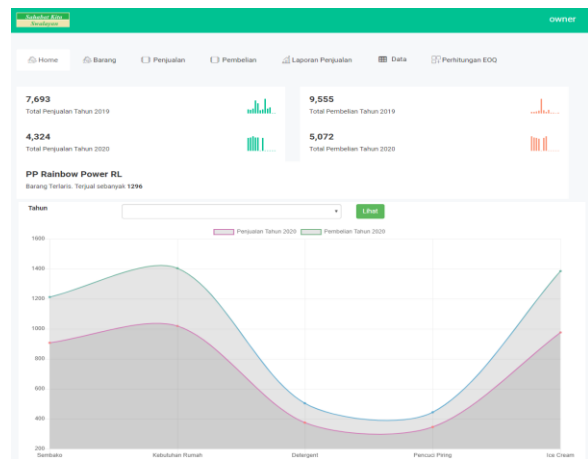


Figure 5 Home Page

After the user has successfully logged, the home shopping and checkout owners will be routed to the home page showing the total sales, annual purchases, and sales and purchase charts. On the home page, the user can know the type of stuff he was selling in 2019. As for the home page can be seen in figure 4.

3) Page Goods

Warehouses will cross-check the sales requests and cross-reference them with data storage items. If they meet the demand will be in acc.

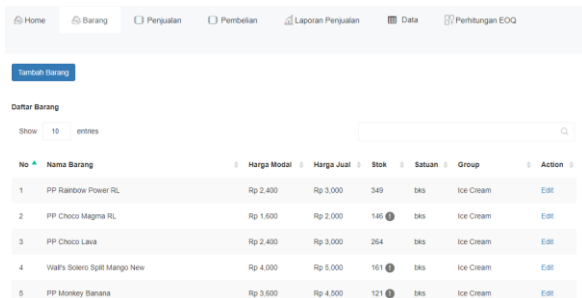


Figure 6 Page Goods

Image 5 is a page showing a data list of goods at the buy price, sell price, stock, units, group, and total. On the item page for doing more user stuff can press the add item button and for viewing details can be selected action edit in action. Can be seen in Figure 9 below.

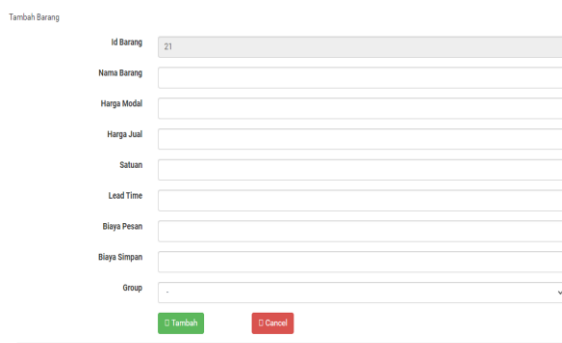


Figure 7 Page Plus Stuff

In Figure 6 is a plus page, the user can do more stuff by pressing the add button, and it will appear on the page like the picture below which the item's id will automatically load. Then the user will fill in the name of the item, the capital price, the price, the unit, lead time, message fee, save fee, and for the group to be selected according to the group.

4) Sales Report Page

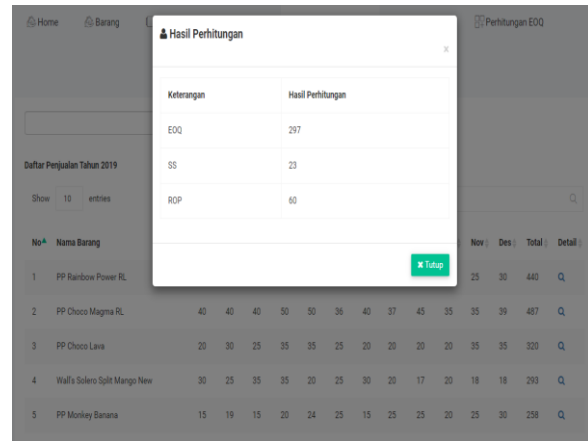


Figure 8 Sales Report Page

Figure 7 provides a year's worth of sales reports and shows detailed accounting for each item. Like EOQ calculations, ss, ROP can be seen in figure 7.

5) EOQ Count Page

In figure 8, the chart of EOQ calculations that the user can do a recalculating to each knows how many EOQ reservations for the next by seeing how many ROP restrictions are. The user can tell the range of messages per day by the reservations frequency for each year. Can be seen in the picture below.

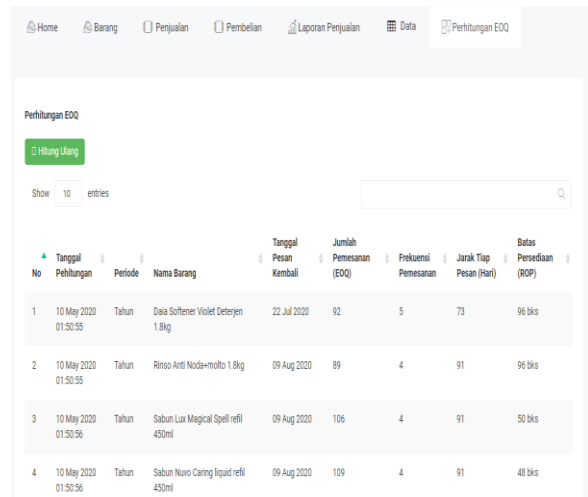


Figure 9 EOQ Count Page

Figure 8 above can be seen when the number of goods has reached ROP's limit so the supermarkets should resupply. This page lists the names of the many reservations that make it easier for the supermarket owner to look at the number of bookings as a reference when he wants to know what stock to order. For the accuracy of the figures given, it can be seen on the comfort and sales charts in the following picture:

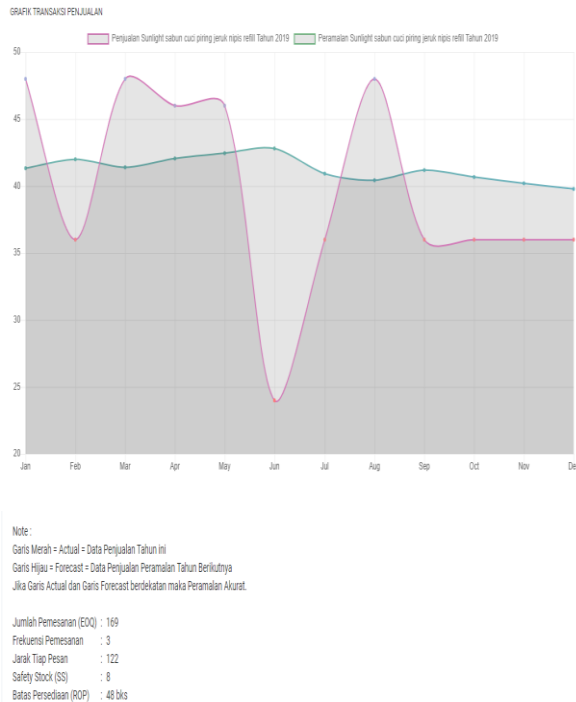


Figure 10 Browser Graph

Viewed in the accompanying picture, where sales charts and browsing are accurate and can be used by supermarkets.

3. Code

The following is one of the codes of the supply design system, using side server language PHP and HTML on method economic order quantity (EOQ).

```
public function hit_EOQ(){
    $delete = $this->EOQ_model->Delete_Kriteria();
    $tahun = date('Y');
    //mengambil data tahun sekarang
    $hariini= date("Y-m-d h:i:s");
    //mengambil data hari ini
    $tahunlalu= $tahun - 1;
    $data['username'] = $this->session-> userdata('username');
    //ambil session username
    $data['nama'] = $this->session->userdata('nama');
    $data['role'] = $this->session->userdata('role');
    $data['penjualan'] = $this->transaksi_penjualan_model->GetDatass();
    //ambil fungsi GetDatass dari model transaksi_penjualan
    $data['jans'] = $this->penjualan_model->GetDatass($tahunlalu,'01');

    // Take the getdatass function from the sales model to pick up
    the sale last year in January
    $data['febs'] = $this->penjualan_model->GetDatass($tahunlalu,'02');
    $data['mars'] = $this->penjualan_model->GetDatass($tahunlalu,'03');
    $data['aprs'] = $this->penjualan_model->GetDatass($tahunlalu,'04');
    $data['meis'] = $this->penjualan_model->GetDatass($tahunlalu,'05');
    $data['juns'] = $this->penjualan_model->GetDatass($tahunlalu,'06');
```

```
$data['juls'] = $this->penjualan_model->GetDatass($tahunlalu,'07');
    $data['aug8'] = $this->penjualan_model->GetDatass($tahunlalu,'08');
    $data['seps'] = $this->penjualan_model->GetDatass($tahunlalu,'09');
    $data['okts'] = $this->penjualan_model->GetDatass($tahunlalu,'10');
    $data['novs'] = $this->penjualan_model->GetDatass($tahunlalu,'11');
    $data['dessa'] = $this->penjualan_model->GetDatass($tahunlalu,'12');
    $data['barangs'] = $this->barang_model->GetDatabarang();
    $data['stok'] = $this->barang_model->GetDatabarang();
    $id_barang =array();
    $biaya_simpan =array();
    $biaya_pesanan =array();
    $lead_time =array();
    $satuan =array();
    foreach ($data['barangs'] as $j){
        array_push($id_barang,$j['id_barang']);
    }

    // Save data to array
    array_push($biaya_simpan,$j['biaya_simpan']);
    array_push($biaya_pesanan,$j['biaya_pesanan']);array_push($lead_time,$j['lead_time']);
    array_push($satuan,$j['satuan']);
}
```

4. Testing

Black box testing was conducted to test functional systems that had been built. Here are some of the test results that have been done, can be seen in the following Table 2:

Table 2 Pengujian Modul Sistem

Cases and test results (normal data)		
Input Data	Expected Result	Conclusion
Username: owner	Log to the owner's main page	[*]Successfully [] Fail
Password: owner	login	
Kasus dan Hasil Uji (Data Salah)		
Input Data	Expected Result	Conclusion
Username: owner	Unable to enter the admin page and will issue an alert/message notifying you	[*]Successfully [] Fail
Password: wrong	that the username or password is wrong.	
Klik button login		
Kasus dan Hasil Uji (Data Normal)		
Input Data	Expected Result	Conclusion
Dashboard	Displays actual sales, purchases, and sales of goods graphs and displays the best-selling items for the year.	[*]Successfully [] Fail
Owner Page		

Testing the user for testing (UAT) is done by testing the system directly for the user and commenting on the established system. Here is a picture of 10 of the results of the UAT tests made to supermarkets and checklists (employees):

Nama : Andee
Posisi : Pemilik toko obat

Tanggal : 7-06-2020
Waktu : 20-00-00

No	Deskripsi	Prosedur Pengujian	Masukan	Keluaran yang Diharapkan	Hasil yang Didapat	Kesimpulan (Ya/Tidak)
1.	Menguji apakah user dapat login jika data yang diinputkan benar	1. Masukkan Username 2. Masukkan Password	Username dan password	Login berhasil dan user masuk kehalaman home	Sistem menampilkan halaman home	✓
2.	Menguji apakah sistem dapat menampilkan data barang	1. Login kedalam sistem 2. Memilih menu barang	-	Data berhasil ditampilkan dalam list barang	Sistem berhasil menampilkan list barang	✓
3.	Menguji apakah sistem dapat menambah data barang	1. Login kedalam sistem 2. Memilih menu barang 3. Memilih tombol tambah	Data barang yang ingin ditambahkan	Data tersimpan dan ditampilkan dalam list barang	Data berhasil tersimpan dan ditampilkan dalam list barang	✓
4.	Menguji apakah sistem dapat mengedit data barang	1. Login kedalam sistem 2. Memilih menu edit barang	-	Data barang dapat diedit sesuai kebutuhan	Sistem berhasil menampilkan perubahan edit barang	✓
5.	Menguji apakah sistem dapat menampilkan data penjualan	1. Login kedalam sistem 2. Memilih menu penjualan	-	Menampilkan list penjualan	Sistem berhasil menampilkan list penjualan	✓
6.	Menguji apakah sistem dapat melakukan penambahan penjualan	1. Login kedalam sistem 2. Memilih menu penjualan 3. Memilih tombol tambah penjualan	Data penjualan yang ingin ditambahkan	Data tersimpan dan ditampilkan dalam list penjualan	Data berhasil tersimpan dan ditampilkan dalam list penjualan	✓
7.	Menguji apakah sistem dapat menampilkan	1. Login kedalam sistem 2. Memilih tombol detail	-	Menampilkan list detail penjualan	Sistem berhasil menampilkan detail penjualan dengan total	✓

Figure 11 Testing UAT

After two months of implementation testing, it is concluded that the system has functioned with expected user needs.

CONCLUSION

The study concludes that supermarkets cultivate more easily in their supply of goods according to the number of economic order quantity (EOQ) methods demanded. Counts of forecasting with a single exponential smoothing method that can help market owners predict sales the following year. The system is also able to function according to the user's need for both trading and purchasing with the features of record-keeping and purchasing. Implementation has been made over the last two months resulting in that the system has been running according to the expected needs.

REFERENCE

- Al-Husaini, M. A., Zul, M. I., & Muslim, I. (2018). Rancang Bangun Sistem Informasi Peramalan Bisnis pada Berkah Swalayan. *Seminar Nasional Teknologi Informasi Komunikasi Dan Industri*, 2579-5406. Pekanbaru: Fakultas Sains dan Teknologi, UIN Sultan Syarif Kasim Riau. Retrieved from <http://ejournal.uin-suska.ac.id/index.php/SNTIKI/article/view/5851>
- Danusaputra, D. I. (2018). ANALISIS PENGENDALIAN PERSEDIAAN HARDWARE LAPTOP MENGGUNAKAN METODE EOQ PADA CV. FIRST DIGITAL COMPUTER DI MALANG. *Jurnal Valtech*, 1(1), 206-213. Retrieved from <https://ejournal.itn.ac.id/index.php/valtech/article/view/209>
- Iqbal, T., Aprizal, D., & Wali, M. (2017). Aplikasi Manajemen Persediaan Barang Berbasis Economic Order Quantity (EOQ). *Jurnal JTJK (Jurnal Teknologi Informasi Dan Komunikasi)*, 1(1), 48. <https://doi.org/10.35870/jtik.v1i1.33>
- Muthia, N., Amalia, H., Puspita, A., & Lestari, A. F. (2019). RANCANG BANGUN SISTEM INFORMASI AKUNTANSI PENJUALAN DENGAN MODEL WATERFALL BERBASIS JAVA DESKTOP. *JITK*, 5(1), 15-22.
- Nissa, K., & Siregar, M. T. (2017). ANALISIS PENGENDALIAN PERSEDIAAN BAHAN BAKU KAIN KEMEJA POLOSHIRT MENGGUNAKAN METODE ECONOMIC ORDER QUANTITY (EOQ) DI PT BINA BUSANA INTERNUSA. *International Journal of Social Science and Business*, 1(4), 271. <https://doi.org/10.23887/ijssb.v1i4.12169>
- Riandy, R., Huliyah, K., & Subiyakto, A. (2011). Rancang Bangun Sistem Informasi Penjualan Barang (Studi Kasus: U.D Cendana Depok Townsquare). *STUDIA INFORMATIKA: JURNAL SISTEM INFORMASI*, 4(1), 1-6. Retrieved from <http://journal.uinjkt.ac.id/index.php/sisteminformasi/article/view/3019>
- Riza, M., & Purba, H. (2018). The implementation of economic order quantity for reducing inventory cost. *Research in Logistics & Production*, 8(3), 207-216. <https://doi.org/10.21008/j.2083-4950.2018.8.3.1>
- Ryando, D., & Susanti, W. (2019). Penerapan Metode Economic Order Quantity (EOQ) untuk menentukan Safety Stock dan Reorder Point (Studi Kasus : PT. Sinar Glassindo Jaya). *Jurnal Mahasiswa Aplikasi Teknologi Komputer Dan Informasi*, 1(1), 76-84. Retrieved from <http://www.ejournal.pelitaindonesia.ac.id/JMapTeKsi/index.php/JOM/article/view/400>
- Thinakaran, N., Jayaprakas, J., & Elanchezhian, C. (2019). Survey on inventory model of EOQ & EpQ with partial backorder problems. *Materials Today: Proceedings*, 16, 629-635. Elsevier Ltd. <https://doi.org/10.1016/j.matpr.2019.05.138>
- Yuniva, I., & Hestiyanto, D. (2018). PERANCANGAN WEB E-COMMERCE UNTUK PENJUALAN SEPATU DENGAN PENDEKATAN MODEL CLASSIC LIFE CYCLE. *Journal CERITA*, 4(1), 24-33. <https://doi.org/10.33050/cerita.v4i1.553>