



DESIGNING A WEB-BASED APPLICATION OF MATERIAL AND INVENTORY MANAGEMENT FOR GARMENT WORKSHOP

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ABSTRACT

Inventory management must be implemented properly so that the flow of goods can be controlled easily. A large number of small sized tools and materials in the workshop of Garment Engineering major require a well-managed inventory. Moreover, the rapid circulation of their inflow and outflow also needs to be addressed well. The garment workshop managers currently only record the material flow manually in the logbook, so it is necessary to design an application that can help them achieving more effective and efficient records. This designed application contains information about the amount of workshop material inflow, outflow and their availability. There are other features which considers the number of materials needed based on the available stock. Barcode system is also utilized to ease the data input process. Usability test was then performed to the application using System Usability Scale (SUS) questionnaire, resulting in average of 63,75 from all of the respondents. That value shows that this application has a low level of usability. Where it is actually understandable since this is the first prototype for the next application developments. All of the application menu and features can be successfully running and the application also helps the garment workshop managers a lot, thus in accordance with the purpose of making this application.

Keywords: inventory management, web-based, application, barcode, usability test

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1. INTRODUCTION

Inventory is a number of tools, materials, and goods available which can be used anytime. Performing inventory management can maintain the business stability by considering total inflow and outflow of goods. The allocated inventory cost for a company accounts for 50% of all invested capital (Heizer and Render, 2010), showing that inventory management is one of the most important aspects to be considered, both in a company or in an institution. Good inventory management is proven to strengthen the company performance (Rahman and Haryanto, 2013).

Some research about inventory management were performed by researchers with different research objects, for instance limited company (Setiadi et al, 2013; Desiyani et al, 2015), clothes store (Ramadhani et al, 2016), handphone service center (Amelia and Devitra, 2018), online shop (Yosan et al, 2018), hardware shop (Saputra, 2016), and heavy equipment firm (Safuan et al, 2020). Their research outputs are the design of inventory management application to maximize employee performance, to reduce user errors caused by manual works, and to ease inflow and outflow stock tracking which include sales transaction record, inventory control, customer data, supplier data, and report making. Inventory management should not only be applied in a company, but also at a workshop or laboratory in an educational institution. Inventory management process in the workshop or laboratory in a university also includes inflow and outflow of goods, both for consumables or non-consumables for students. One should also manage the spare-part inventory of all machines in the laboratory and have a good tracking record of borrowed laboratory tools. Research regarding this topic has been performed in several educational institutions, namely in Computer laboratory at Universitas Muhammadiyah Sukabumi (Santi & Asriyanik, 2015), at Universitas Diponegoro (Novianto, 2017), at AKMI Baturaja (Romzi, 2014), at Ukrida (Septianto dan Purba, 2012), at UPI-YPTK Padang (Kurniawan, 2008), and at STIKOM Surabaya (Gunawan, 2013; Suryani, 2011), and Business Administration laboratory of Politeknik Negeri Banjarmasin (Rohayati dan HJ, 2016). Those previous researches were focused in borrowing and returning records of tools,

monitoring of borrowing cycle, easing the laboratory service, monitoring goods condition, stock-opname monitoring tools, and preparing spare-part used in the computer laboratory. Features developed on the application for education facilities also varies, ranging from stock recording and monitoring to stock forecasting (Elmerillia et al, 2021), with various type of application and programming language, namely Content Management System (Safuan et al, 2020), VB Net Programming (Bilqis & Sahfitri, 2021), and PHP programming language (Setiawan & Nada, 2020).

Textile Community College of Surakarta (AK-Tekstil Solo) has several laboratories and workshops, namely spinning workshop, weaving workshop, garment workshop, pattern making room, cutting room, computer laboratory, and testing laboratory. Comparing to previous researches which almost all of them performed in a computer laboratory, this research focused in the garment workshop. The garment workshop managers currently only record the material flow manually in the logbook. Problems often occurred when there are false records on the logbook, which results in an inaccuracy of the total inventory. Garment workshop inventory has hundreds of machines (sewing machines, button machines, plotters, computers, etc) and 169 types of tools and equipment in small size with rapid inflow and outflow. They are for instance fabric, various kinds of needle and yarn, also other kinds of sewing tools (scissors, measure tapes, gun tag and pin, ruler, pattern paper, hole punch, etc) and sewing accessories (bobbins, buttons, ribbons, labels, velcros, zippers, etc). It adds the complexity of managing the inventory if it is still manually recorded on the logbook. The possibility of miscalculation and mismanagement is considered high since there are thousands amount of inventory that need to be managed accurately. The workshop managers also often face difficulties when performing stock-opname caused by the manual stock recording. The workshop managers need to purchase new stocks of the practicum equipment each semester. The stock discrepancy between the recorded data and the real data results in incorrect amount of purchase. This leads to stock shortage when purchasing less than needed, and overbudget when purchasing more than needed. Stock shortage will bother the fluency of

practicum and lectures thus needs to be avoided. That's why a correct and valid record is required in performing the business process of the workshop well.

Hence it is necessary to design an application that can help them achieving a more effective and efficient records to support the practical lectures. When this is achieved, the stock availability of the garment workshop tools and equipment will be well-maintained and sufficient for those practical lectures. There are also another features which considers the number of materials needed based on the available stock. Barcode system is also utilized to ease the data input process. Usability test is planned to be performed to the application to test whether the application prototype is usable and ready to be launched in a final form.

2. METHODOLOGY

2.1. Application Design

Several steps are taken to develop the application for inventory management of garment workshop at AK-Tekstil Solo. It is started by collecting research material, performing literature study, designing the system needed, implementing the designed system, testing the application prototype, analyzing the research result, and finally evaluating the system design needed which include database design, interface design, and decision system design of the application system. Although AK-Tekstil Solo have several workshops and laboratories, in this first research the designing of the application is for the garment workshop only because of the reasons already stated in the background. Once the first application prototype has already been established and can function well, it can be applied and the features can be developed more for another workshops and laboratories.

This web-based application is designed in Windows operation system with PHP, Javascript, and CSS programming language with the help of xampp program. It has a customized design after considering the garment workshop needs so that they will have the flexibility to adjust the database or interface menu. Barcode system is also utilized to ease the data input process since there are a lot of tools and equipment of the practice tools which are small in size.

2.2. Data Attributes

The raw data needed for designing this application includes all inventories owned by the garment workshop which is used for students practice lectures, with several attributes. Attributes were selected based on the workshop managers needs on managing the inventory. For example, the 2nd level attributes of product name are divided into color and size in order to easily search for the correct product in the future. The consumables and non-consumables type also need to be distinguished to understand whether the product can be used only one time and multiple times. All of the attributes are chosen to make the inventory management more efficient.

Those products are stored in four different workshops, such as cutting workshop (CU), CAD workshop (CA), manual pattern making workshop (PO), and sewing workshop (SE). The raw data is then converted into new data with new added attributes which is suitable for the application. Product Code is also generated by the system for each product. The code consists of seven (7) digits, the first 2 digits denote the workshop name where the products are stored (CU, PO, SE, CA), the next 3 digits denote the product number, the next 2 digits denote the product variant. The raw data can be seen in Table 1 while the converted data can be seen in Table 2.

Table 1. Raw Data Attributes

1 st Level Attributes		2 nd Level Attributes	
No	Attribute Name	No	Attribute Name
1	Product name		
2	Product amount	A	Good product
		B	Broken product
3	Units		
4	Location/rack		
5	Workshop name		

Table 2. Converted Data Attributes

1 st Level Attributes		2 nd Level Attributes	
No	Attribute Name	No	Attribute Name
1	Product name	1	Colour
		2	Size
2	Product code		
3	Brand		
4	Amount		
5	Units		
6	Safety stock		
7	Stock type	1	Self-shopping

1 st Level Attributes		2 nd Level Attributes	
		2	Supplier
8	Location/rack		
9	Workshop name		
10	Product type	1	Consumables
		2	Non-consumables

This application develops special features to help the workshop manager when determining new procurement of tools and equipment automatically each semester study by considering their safety stock. New attributes are also used for the formula needed to run the features, as shown in Table 3.

Table 3. Attributes for Procurement Feature

No	Attribute Name	Explanation
1	Course/lecture name	
2	Output name	Output produced by the student (Almamater jacket, shirt, graduation gown, etc)
3	Product name	
4	Variant name	Yarn color, fabric color, etc
5	Units	
6	Stock	Automatically generated by the application
7	Total of students	Students enroll in each course
8	Allocation per student	Number of materials needed by each student
9	Allocation per course	Number of materials needed per course
10	Divided units	Constants for the number of materials per units (pcs per box/set)
11	Net requirement (NR)	Total students*allocation per students*allocation per course)/divided unit
12	Allowance	Net requirement x 10%
13	Total requirement	(NR-stock)+allowance. (if result is negative then total requirement is 0)
14	Price per pcs	Price per pcs of product
15	Total cost	Total cost for all procurement

2.3. Usability Testing

After finishing the web-based application design and the barcode system, usability testing is performed to the application to test the value of feasibility of the system based on the effectivity, efficiency, and satisfaction of the user to a certain

context. The within-subject testing is used in this research since each respondent perform several different tasks sequentially. The usability testing is performed using two kind of tests, namely direct testing and System Usability Scale (SUS) questionnaire. The direct testing is done by giving several tasks to the respondents then observing their error rate and comments when performing the tasks. After all data are collected, it then can be analyzed to draw the conclusion. For the direct testing, each respondent is asked to perform a total of 15 tasks when using and accessing the web-based application, as follows:

1. Login to the website
2. Search for total stock of products
3. Edit (add/subtract) stock of existing non-consumable products.
4. Add new consumables product manually.
5. Know total stock and product type on each workshop.
6. Perform stock update by uploading Ms Excel file.
7. Perform transaction process of borrowing or using of the workshop products.
8. Know transaction list of borrowing or using of the workshop products
9. Perform calculation of total student practical expenses.
10. Update (add/subtract) unit or brand data.
11. Update (add/subtract) product data and upload the product image/photo.
12. Update (add/subtract) total number of workshops.
13. Update (add/subtract) students' data.
14. View and print the report
15. View the user guide.

While the second test of SUS questionnaire is done to analyzed respondent or user satisfaction when using the application. It is an indirect testing since it is done after the respondent finish performing the tasks given. There are several questions with scale to answer those questions. Questionnaire paper is given to the respondents and the respondents are asked to answer all of the questions provided. There are 10 statements with 1-5 scale of likerts answer as stated in Table 4.

Table 4. Likert Scale

Scale	Meaning
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

The questionnaire statements are as follows:

1. I think I will use this web-based application again in the future to search for information
2. I think this web-based application is quite complicated to use
3. I think this web-based application is easy to use.
4. I need help from other persons or technician when using this web-based application.
5. I think this web-based application features are running smoothly
6. I think many things in this web-based application are inconsistent
7. I think other persons will understand on how to use this web-based application quickly
8. I think this web-based application is confusing
9. I have no difficulty when using this web-based application
10. I need to get used to the environment first before using this web-based application

3. RESULTS AND DISCUSSION

3.1. System Design and Features

Material flow system is designed as follows:

- a. Product Type
The product type is classified into 2 types: consumables and non-consumables. The consumables product stock will be deducted after product outflow for practicum or students needs, and it will be added only when the workshop manager adds the stocks. While non-consumables product stock will be deducted after product borrowing, and not only will be added when the product manager adds the stocks, but

also when the product is returned to the workshop

- b. Stock Updating Process
Stock updating process can be done in 2 ways, by updating the number of the stocks (for existing product, for updating the stock condition) or by adding new stocks (for brand new product). Stock updating process can be done manually or by uploading Excel file to the system for uploading in batch.
- c. Transaction
Two transaction process is developed in the application, namely tools borrowing or practicum material request. Only registered user, who are active students can perform both transactions. Transaction can be performed in two ways: manually typing the data and scanning the barcode attached on the product.
- d. Calculation of total practicum expenses
This is the system used to automatically calculate total student practicum expenses using the given formula.
- e. Safety Stock
Safety stock is a stock limit that the stock is considered safe and enough for operations. It gives automatic notifications to the workshop managers about stock condition.

Several features are developed for the application, such as:

- a. Search column
Search column on the website dashboard are designed to ease the product searching process besides using barcode scanner
- b. Stock notification
Workshop manager is notified when stocks are running out (less than safety stock)
- c. Stock input and stock update
This feature is needed for updating the stock (both for existing and new products)
- d. Tools and materials transaction
The main features of the application, to ease and automate the process of borrowing tools and using practicum materials.
- e. Practicum expenses calculation
Special features to help workshop managers calculate practicum expenses automatically.
- f. Master data for each attribute

Master data is needed to ease the product search process. Dropdown menu containing product data from the master data is utilized in the search column.

- g. Reports
All reports related all data needed by the workshop managers can be generated in .xls or .csv file format.
- h. User guide
User guide menu is developed containing user guide file to guide new users on how to operate and use the application.
- i. Batch upload
Batch upload is developed to ease and fasten the data input. Particular file format is given to reduce error on the batch upload.

3.2. Interface Design

Interface design of this web-based application are as shown in Figure 1 to Figure 16



Figure 1. Login Page

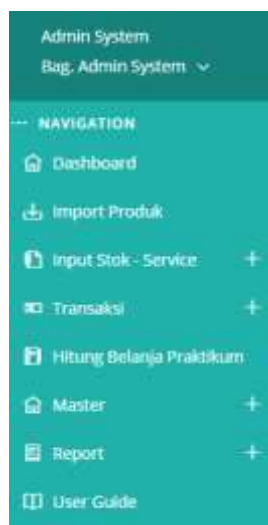


Figure 2. Menu Bar



Figure 3. Dashboard Page



Figure 4. Consumables Stock Input Page



Figure 5. Consumable Stock Lists



Figure 6. Consumables Stock Update



Figure 7. Non-Consumables Stock Input



Figure 8. Non-Consumables Stock Update



Figure 9. Adding New Transaction Page



Figure 10. Transaction List



Figure 11. Practicum Expense Calculation



Figure 12. Students Master Data

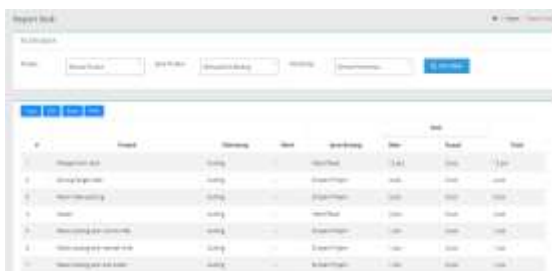


Figure 13. Stock Report



Figure 14. Transaction Report



Figure 15. Log Stock Report



Figure 16. Practicum Expense Report

3.3. Application Trial

Seven processes are performed to test whether the application can perform the designed function and features. Those processes are as follows:

- Login
- Data input (stock, product, master data, etc)
- Stock update
- Upload the product image
- Print reports
- Barcode scanning
- Perform transaction

All seven processes above have been successfully performed; hence the application can run as desired.

3.4. Usability Testing Results

- Direct Testing

From all the tasks we give to the respondents to do, four tasks were unsuccessfully performed, namely:

 - Edit (add/subtract) stock of existing non-consumable products.
 - Add new consumables product manually.
 - Know total stock and product type on each workshop

- Update (add/subtract) product data and upload the product image/photo.

Given the unsuccessful tasks above and the inputs given by respondents, we recommend the following on the next application development:

- Uniform the use of all terms using Bahasa Indonesia
- Change “Order transaction” to “Borrowing transaction”.
- Move the stock upload using Ms. Excel features to the “Stock” tab/menu.
- Add information needed on each menu to give brief explanation of the menu.
- Show “update stock” menu to be easier to be found

b. System Usability Scale (SUS) Questionnaire

The System Usability Scale (SUS) Questionnaire score system (Brooke, 1996) is as follows:

- For statements in odd number: minus 1 point from the given response
- For statements in even number: minus 5 point from the given response
- Then add all converted values of response, multiply it with 2,5 to convert the value into range 0-100.

The result of SUS questionnaire score is resulting in average of 63,75 from all of the respondents. That value shows that this application has a low level of usability. It is actually understandable since this is the first prototype for the next application developments. All of the application menu and features can be successfully running and the application also helps the garment workshop managers a lot, thus in accordance with the purpose of making this application

For the next development, user interface and user experience design have to be implemented well in order to have a user-friendly web-based application. Users also have to make sure to have a good internet connection, since this web-based application can be run when it is connected to the internet.

This web-based application is finally can result in easier and faster inventory management system of Garment workshop, in several areas namely:

- Generate more accurate stock reports
- Get accurate information faster on stock level of practicum tools and material based on their safety stock.
- To ease and fasten transaction process of stock inflow and outflow using barcode system.
- To ease practicum and lectures
- Be a real example to the students on information technology implementation of inventory management in small scale of campus workshops.

4.CONCLUSION AND SUGGESTION

The purpose of this research to solve the current problems in garment workshops, where the workshop managers faced difficulties on controlling fast inflow and outflow of many kind of inventory in four different workshops, both consumables stock or non-consumable stock. That complexity is solved by a web-based application which can run successfully. Several features of the application include barcode scanning, automatic reorder calculation, batch upload, and report generations. Application trial have been done to the users and usability testing was also performed. Although the usability test result shows that the application has low level usability, all features have been successfully run. The application also helps the garment workshop managers a lot, thus in accordance with the purpose of making this application. The application can be developed more for other workshops like spinning and weaving, and to improve its usability level by applying good user interface and user experience design.

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References

- Amelia, A. and Devitra, J., 2018. Analisis dan Perancangan Sistem Informasi Manajemen Persediaan Barang pada Advan Service

- Center Jambi. *Jurnal Manajemen Sistem Informasi*, 3(1), pp.856-869.
- Bilqis, J. S., & Sahfitri, V. (2021, May). Sistem Informasi Inventori Alat Dan Bahan Pengujian Pada Laboratorium Penguji Bkipm Menggunakan Vb. Net. In *Prosiding Seminar Hasil Penelitian Vokasi (Semhavok)* (Vol. 3, No. 1, pp. 21-29).
- Brooke, J., 1996. SUS—a quick and dirty usability scale. Redhatch Consulting Ltd., 12 Beaconsfield Way, Earley. Reading RG62UX, UK.
- Desiyani, M. and Putri, K.D., 2015. Program Aplikasi Persediaan Barang Pada PT. Panji Surya Abadi. *Jurnal TICom*, 3(3), p.93933.
- Elmerillia, E., Lindawati, L., & Salamah, I. (2021). Web-based Application Forecasting of Components and Tools for Practicum in Telecommunication Engineering Laboratory/Workshop of State Polytechnic of Sriwijaya. *ELKHA: Jurnal Teknik Elektro*, 13(2), 97-104.
- Gunawan, D.W., 2013. LKP: Aplikasi Inventarisasi Hardware Komputer di Laboratorium Komputer STIKOM Surabaya Berbasis Web (Doctoral dissertation, STIKOM Surabaya).
- Heizer, J. and Render, B., 2010. Capacity and Constraint Management.
- Kurniawan, W.J., 2017. Sistem Informasi Pengelolaan Laboratorium Komputer UPI-YPTK Padang. *Jurnal Edik Informatika Penelitian Bidang Komputer Sains dan Pendidikan Informatika*, 2(1), pp.95-101.
- Novianto, D.K. and Waspada, I., 2017. Rancang Bangun Aplikasi Dashboard Untuk Monitoring Persediaan Barang (Studi Kasus Laboratorium Informatika Universitas Diponegoro) (Doctoral dissertation, Universitas Diponegoro).
- Rahman, A. and Haryanto, R., 2013. Pengaruh Strategi Bisnis Terhadap Hubungan manajemen Persediaan dan kinerja Perusahaan (Studi Pada Perusahaan Publik di BEI). *Ekonomi & Bisnis*, 12(1).
- Ramadhani, A.R. and Fitriani, L., 2016. Perancangan aplikasi persediaan barang dan transaksi penjualan barang di Alya Store. *Jurnal Algoritma*, 13(2), pp.384-390.
- Ramadhani, A.R. and Fitriani, L., 2016. Perancangan aplikasi persediaan barang dan transaksi penjualan barang di Alya Store. *Jurnal Algoritma*, 13(2), pp.384-390.
- Rohayati dan HJ, A.I., 2016, Perancangan Dan Implementasi Sistem Informasi Inventaris Laboratorium, *Jurnal INTEKNA*, Volume 16, No. 2, halaman 101-200
- Romzi, M., 2014, Rancang Bangun Sistem Informasi Inventaris Laboratorium AMIK AKMI Baturaja, *Jurnal Media Informatika dan Komputer*, Volume 4, No1.
- Safuan, B., Arief, R. K., & Adesta, E. Y. T. (2020). Web based e-catalog implementation at TPK-KOJA: Case study of stock inventory division. *International Journal of Advanced Science and Technology*, 29(7), 481-488.
- Santi, S. and Asriyanik, A., 2015. Aplikasi Inventaris Laboratorium Teknik Informatika Pada Universitas Muhammadiyah Sukabumi. *SANTIKA (Jurnal Ilmiah Sains dan teknologi)*, 5(2), pp.423-428.
- Saputra, F., 2016. Perancangan Dan Implementasi Sistem Informasi Inventory (Studi Kasus: Tb. Cipta Karya). *Sistemasi: Jurnal Sistem Informasi*, 5(1), pp.10-19.
- Septianto, A. and Purba, F.R., 2012. Sistem Informasi Laboratorium Komputer UKRIDA. *Jurnal Teknik dan Ilmu Komputer*, pp.326-316.
- Setiadi, A.W., Siregar, A.J. and Agung, A.A.G., 2013. Aplikasi Persediaan Barang pada PT. Banten Tirta Kharisma. *Jurnal Teknologi Informasi*, 1(6), pp.220-223.
- Setiawan, W. N., & Nada, N. Q. (2020). Perancangan Sistem Informasi Inventory

Laboratorium Komputer Universitas PGRI Semarang Berbasis Web. In Science and Engineering National Seminar (Vol. 5, No. 1, pp. 818-824).

Suryani, N., 2011. PA: Sistem Administrasi Manajemen Pada Program Studi Komputer Multimedia STIKOM Surabaya (Doctoral dissertation, STIKOM Surabaya).

Yosan, R.B., Kholil, M. and Hanum, B., 2018, March. Implementation of Inventory Management System (IMS) case study on XYZ online store business unit. In IOP Conference Series: Materials Science and Engineering (Vol. 343, No. 1, p. 012022). IOP Publishing.