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AUTOMATION OF ORDER COSTING ANALYSIS BY USING VISUAL BASIC FOR APPLICATIONS IN MICROSOFT EXCEL

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Abstract:

In the modern world of technologies (sciences of arts), optimum operation time is the prime consideration. Technologies with greater operation time are needed to be modified or replaced as per the requirement of the current scenario. In small and medium enterprises of developing countries, almost all the reporting activities are conducted in Microsoft Excel. The manual operation in Microsoft Excel takes a long time (17.37 minutes, only if there was one order of only one article with one color) of the users; furthermore, there can also be a greater chance of error in the report. In the same way, the order costing report at the ABC footwear company of Lahore is prepared manually in Microsoft Excel which used to take a long time to be prepared along with the greater probability of errors in the report. Because of the above-mentioned reasons, the order costing report was decided to be automated with the help of visual basic for applications (VBA) in Microsoft Excel. The manual procedure including all the activities was collected from the planning and costing department of ABC Company. Moreover, all the activities were listed down and their time study was conducted. VBA macros were programmed with the objectives of automating all the manual tasks of the order costing report in Microsoft Excel and eliminating the chance of error (calculation error made by the employee). Macros, were programmed by the use of conditional statements, (i.e. if and else conditions) and various types of loops, (i.e. Do while loop and for loop). Automated decisions were made with the help of conditional statements during the operation and the conditional statements were circulated with the help of loops across the whole worksheet. Two userforms were designed for the execution of macros by the click of command buttons (having macros at their back). Total eight worksheets were incorporated into the automated template. All the programmed VBA macros were explained with the help of flowcharts made in the Microsoft Visio. After the report was automated, a time study of operations performed after each click was conducted with the help of stop watch. The data obtained by the time study was entered into Microsoft Excel so that the time of old and suggested methods could be compared. Comparison of both methods indicated that the suggested method took 85.92% less time as compared to the old method of preparing the order costing report. At the same time, the report made by the suggested method was free of errors and the workload of employees was also reduced.

Keywords: footwear; optimization; order costing; visual basic for applications.

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1. Introduction

Calculation of cost is an easy task but its comprehension is a difficult job (Mussatti & Vatavuk, 2017). There are two types of cost i.e. fixed and variable costs. Fixed cost remains constant in all cases whereas the variable cost varies with the production volumes. Variable costs can increase or decrease correspondingly with the increase or decrease in the production volume (Effiong & Oti, 2012). Measurement of products` cost or services can be conducted at different stages by the help of which the costing accuracy is achieved to optimize the profitability of the business (Şuteu et al., 2016). In the garment industry, costing is conducted at the four different stages i.e. preliminary costing, cost estimating, detailed costing, and actual costing (Howard et al., 2019). Similarly, in the case of a company, costing is conducted at three different stages i.e. initial costing, order costing, and post-order costing. When the customer puts a quotation for the specific article, initial costing is conducted to provide him the cost and price of the article(s) (one article). After the order is received, then order costing is conducted (before

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order manufacturing) which is based on the whole order (consisting of the numerous articles of various colors). During the manufacturing of the order, a customer sometimes makes some changes in the material, and process which causes an increase/decrease in the cost. Finally, post-order costing analysis is conducted to indicate the difference in the estimated and actual cost incurred on the order. It is not necessary that the cost of an order calculated at the sample level would always be equal to the actual incurred cost because of various factors having an impact on the cost (Gandhi et al., 2015). Calculation of manufacturing cost is tremendously complex and includesseveral research areas (Liu et al., 2017). In the footwear industry (ABC company of Lahore), it is calculated by summing up the cost of cutting, stitching, hand stitching, molding, lasting and job work, tooling cost, and total overheads. As concluded by (Effiong & Oti, 2012) that manufacturing cost is cumulative of all the resources which are used directly for the production of goods and services (Effiong & Oti, 2012). Generally, the cost is often influenced by the current material prices and overheads which are calculated based on experience (Howard et al., 2019). The total cost of the order is calculated by summing up the material, labor, overheads, tooling, and cost of b-pairs. These all costs are included in the order costing report, which is made in Microsoft Excel manually at the case Company. Manual preparation of the report can cause the mistakes and error in the report which on correction can take the tremendous amount of time. In order to avoid the error and minimize the preparation time of order costing report, the manual operation of the report was automated by the use of visual basic for applications (VBA) in Microsoft Excel. VBA is actually a programming language of Microsoft Excel and can be used to write programming and run through in anMicrosoft Excel workbook. It manages to reduce error during the calculation and also reduce the time required to perform all those calculation (Abidin et al., 2015). For the calculation of order cost, several equations are used. The use of Visual Basic for Application (VBA) in Microsoft Excel is very broad in terms of mathematical learning such as creating variable equations and obtaining the results from variable equations (Bernard et al., 2018; Norton & Tiwari, 2013). VBA, also known as macro programming. Macros are a bunch of instructions that let office components automate the combination of user-specified functions so that the complex operations can be automated (Ding et al., 2017). There is no or little cost associated with the systems made by the use of VBA in Microsoft Excel and at the same time, complex analysis with high performance can be conducted. Moreover, less skilled analysts can produce accurate results with greater efficiency, when the report is completely automated (Blayney & Sun, 2019). Once the macros are programmed in Microsoft Excel they can be executed by just clicking the button. By the use of VBA, users can automate all the spreadsheet tasks and develop user-defined functions as well (Abraham et al., 2008). VBA is quite different in the comparison of Microsoft Excel formulae and the provided programming environment (visual basic editor) is also different as compared to the spreadsheet (Abraham et al., 2008). The advantages of Microsoft Excel with Visual Basic for Application (VBA) are (1) the images are more interactive with different sizes and can make more; (2) more economical; (3)saving time; (4) the software is easy to find (Bernard et al., 2018). VBA enables building user-defined functions into most Microsoft Office products, such as Microsoft Word, Excel, and PowerPoint. Considering Microsoft Excel has been widely accepted in the industry as the standard for spreadsheets, the implementation of the method with VBA could be used in most consulting companies (Cirujano & Zhu, 2013). This research paper presents an explanation of the automation of order costing reports. Moreover, it contributes to presenting the framework for the calculation of cost in the footwear industry.

2. Literature Review

As per the requirement of the costing department of ABC Company, the costing calculations were kept to be the same and the manual operation in the report was fully eliminated by the use of visual basic for applications. In this regard, the research in relevance with automation/ optimization by using VBA is presented. Zainal Abidin et al., (2015) researched to make an application to calculate Water Quality Index (WQI) and Air Pollutant Index (API) by the use of VBA in Microsoft Excel. The application was set to calculate directly the indices. The required formulae were translated into the code. Moreover, a description of each of the indexes was programmed; so that details of measured index value could be shown automatically along with it (Abidin et al., 2015). Ahmadi et al., (2018) researched the implementation of the CTR Dairy model by the use of VBA in Microsoft Excel. CTR dairy is known as the dynamic simulation model for grazing lactating dairy cows which are used for the prediction of production of milk and profits based on the various parameters i.e. ruminal digestion and the absorption of nutrients under intermittent schedules of feeding. Due to the discontinuation of SMART software and the non-availability of its clients; the CTR dairy model was translated into Microsoft Excel VBA to convert the input into output. With the help of this research, it was made available to a broad range of dairy farmers, dairy nutrition consultants, extension advisors, and researchers (Ahmadi et al., 2018). Belchior Junior et al., (2011) developed the new application for the results of post-processing the Reactor Excursion and Leak Analysis Program 5 (RELAP5) by using Microsoft Excel VBA. It is indicated to be quite a useful instrument to speed up the output data analysis (Belchior Junior et al., 2011). Rushit Hila (2009) programmed (in VBA) the application for the identification of outliers in the data and the arrangement of data automatically. In the application, several steps were automated for cleaning and verifying data before importing it into MS access (used as a database) (Hila, 2009). Cirujano and Zhu (2013) developed a new method for the automatic creation of manpower planning reports by the use of VBA in Microsoft Excel. As per the new method, roles and schedules of the engineers in various projects were collected. The collected information was compiled, analyzed, and organized. In this regard, the engineer`s information in various projects could be retrieved and the plans for the engineers could be made. The method was validated in a consulting firm with greater than a hundred employees. It was indicated that man power planning report could be generated automatically; by which a tremendous amount of time and cost will be saved (Cirujano & Zhu, 2013). Sato and Yokoyama (2001) developed an application by using

VBA in Microsoft Excel for the transfer of image data from the data set to a worksheet on click of Web-icon (Sato & Yokoyama, 2001). Lessa et al. (2016) automated a practical mathematical model for the calculation of packaging and the logic program by using visual basic for application (VBA) in Microsoft Excel. The graphic designs were automatically created for how the packages are being filled (Lessa et al., 2016). H. Evensen (2014) implemented instrument communication in Microsoft Excel by using VBA for the first time in 2014 (Evensen, 2014). Donald E. Blattner and F. Valrico (2007) invented an automatic report generation system by using VBA in MS projects. The invented system, allowed the user to select, format filter, and sort the report by the help dialogue box that appeared on the screen (Blattner & Valrico, 2007). Wettlaufer (2010) implemented mapping rules in the form of VBA macros in Microsoft Excel. For each report, one macro was programmed. Expected values were written by the macros in the separate spreadsheet i.e. expected values spreadsheet. Then it sends the patient's follow-up to the merline.net server for processing the data and the processed patient follow-up session was generated contained of reports package in the WinRAR file (Wettlaufer, 2010). Norton and Tiwari (2013) used VBA for the development of code for making engineering students understand the analysis of novel freezing technology (Norton & Tiwari, 2013). Bartoszewicz and Wdowicz (2019) proposed a new method for the analysis of the production process, its visualization and automation was consisted on the integration of production planning module of SAP enterprise resource planning (ERP) with Microsoft Excel worksheet and VBA. The new process for data migration and analysis was redesigned and implemented; which was more flexible and faster and by the help of which whole process of complex analytical report was speed up (operation time reduced from 2 hours to 5 minutes) (Bartoszewicz & Wdowicz, 2019). Harahap and Azmi (2017) conducted a research with the objective to develop the application by the use of VBA which could make the small level rainwater conveyance system by using rational method as presented in MSMA 2 (Harahap & Azmi, 2017). Yan and Wan (2017) developed an application by the use of Microsoft Excel VBA for an automatic calculation and generation of bill of material (BOM) of transmission line. Efficiency and accuracy are greatly improved by the design and application of the template and errors in the process of making total steel BOM were reduced (Yan & Wan, 2017). Kalwar and Khan (2020) automated procurement and purchase order report at footwear industry; after automation, the procurement report used to take 516.578 second to be completed instead of 2076.751 seconds. Moreover, purchase order took 2-3 seconds instead of 15-20 minutes after automation (Kalwar & Khan, 2020b).

3. Research Gap

From the above-cited literature review, visual basic for applications was underlined to be used in the various fields for automation and no research was found to be done in the field of automation in costing by using VBA. From this statement, the novelty of this research can be figured out. This paper contributes to providing the framework for the automation of reporting in the costing field.

4. Problem Statement

The footwear industry is growing rapidly around the world (Arain et al., 2020; Chaudhry, Kalwar, et al., 2021; Chaudhry, Khan, et al., 2021; Kalwar, Marri, & Khan, 2021; Kalwar, Shaikh, et al., 2020; Kalwar & Khan, 2020b, 2020a; Khan, Kalwar, et al., 2021) but in the context of computerized automation, it lags. The usage of the newest technology leads to increased performance, efficiency, and cost-effectiveness (Arain et al., 2020; Chaudhry, Kalwar, et al., 2021; Chaudhry, Khan, et al., 2021; Kalwar, Marri, & Khan, 2021; Kalwar, Shaikh, et al., 2020; Kalwar & Khan, 2020a, 2020b; Khan, Kalwar, et al., 2021). In this era of machine learning and artificial intelligence, still, in small and medium enterprises, reports with important and sensitive calculations are prepared in Microsoft Excel manually. Because of manual operation, the probability of mistakes in the calculation is greater; at the same time, correcting those mistakes is a time-consuming job that adds no value to the process. In the planning and costing department of ABC Footwear Company, preparation of order costing and post-order costing reports was a time-consuming job and the chance of mistakes was greater as well. Therefore, it was decided to program its manual operation in Microsoft Excelwith the help of VBA. After the automation of mentioned report, the non-value-added time will be saved. Most importantly, the reports produced from the programmed spreadsheet will be error-free.

5. Research Methodology

This research is the representation of improvement that has been made in the way (manual to automatic) the order costing report was used to be prepared at ABC footwear company of Lahore. Data regarding the calculations and formation of both reports were obtained from the planning and costing department. A Series of manual tasks used to be performed while making the report was noted down and their time study was conducted with the help of stop watch. The equations and formulae which were being used for order costing of footwear were presented and explained. At the same time, various types of costs included in the total order cost were also explained in detail. The report was then automated by the use of visual basic for applications in Microsoft Excel. At the various stages of automated report formation, decision-making was necessary and the decision was made by the use of conditional statements i.e. if/else and case statements. IF function allows the system to check if the value satisfies the defined criteria, it returns the desired result and another result is put in case of value doesn`t meet the defined criteria (Blayney & Sun, 2019). Sometimes, there are multiple conditions in the 'if statement, and the result are needed to be returned if both conditions come true or one of the two. In that situation, logical operators e.g. conjunction (And), disjunction (or), and negation (Not) are used (Hart-Davis, 2005). When there are numerous items in the worksheet and set of applied conditions is applied on each of the rows containing item descriptions and provided values; therefore, to decide among the values of each item in each row down, the condition is needed to be checked repeatedly in the same way row by row so that the order to be procured can be calculated. The term looping refers to the repetition of a block of VBA statements for the number of times (Walkenbach,

2015). For-Next Loop is the simplest type of loop. The counter variable controls the looping, which starts from 1 and stops at another value (Walkenbach, 2015). If the user wants the conditions to be repeated as much as the number of items present in the worksheet, then the loop would start at one and will stop at the counted number of non-empty rows in the worksheet. The same logic has been used in the procurement calculation mechanism. In the same way, the transfer of data from one worksheet to another was also conducted by the help for loop in this report. Loop was repeated as many times as the number of non-empty rows in the worksheet (of the data to be transferred). Sometimes, when VBA code fails to run and in that situation, Microsoft Excel gives an error which is often un-understandable by the common (unfamiliar with such systems) user. By the use of 'On Error statement' in VBA code (*on error resume next*) lets the user bypass Microsoft Excel's built-in error handling and it handles the situation by executing the next task programmed in the code (Walkenbach, 2013). Collected activities and their recorded times were put in the Microsoft Excel in which the average time of various activities was calculated on the same time graphs were plotted in Microsoft Excel. As per the old method of reports` formation, all the tasks were performed manually in Microsoft Excel but with the help of visual basic for applications, all the manual tasks were programmed to be performed with just a few clicks. Process flow charts of the programmed macros were made in Microsoft Visio.

6. Order Costing

The ultimate goal of any business is to multiply the money in the form of profit irrespective of the nature of the production. It is then essential for the business to be aware of the instrument and its use is known as 'cost' (Şuteu et al., 2016). The cost management system is consisted ofseveral developed methods for the planning and controlling of cost so that the organizational goal can be achieved (Keramatpanah et al., 2016). Among the techniques of calculation of the cost of production activities to be carried out in the factory, order costing is one of the main techniques to estimate the cost to be incurred on the received order.

When the customers put an order, before the start of production, the costing department was supposed to prepare the order costing reports for the orders. With the help of order costing reports, it is revealed that how much material cost, labor cost, tooling cost, overheads, and B-pair cost will be incurred on the specific order. Estimated total cost on the particular order (number of articles (shoes) of various colors and sizes) is calculated. Estimation of total order cost includes the various formulae which are given in the below-given headings with detailed descriptions.

Indices and the parameters are defined below which were used to be used in the calculation of order costing.

Indices

h = index refers to the number of shoe material items required for the production of the shoe *(h =1, 2, 3, …, p)*

i = index refers to the number of leather items required for the production of the shoe *(i =1, 2, 3, …,n)*

j = index refers to the number of colors of the shoe to be produced *(j =1, 2, 3, …, m)*

k = index refers to the number of articles (shoe type) in the order *(k =1, 2, 3, …, l)*

o = index referring to the cutting operations performed on the article *k* of color *j (o = 1, 2, 3, …, q)*

s = index referring to the sewing operations performed on the article *k* of color *j (s = 1, 2, 3, …, r)*

g = index refereeing to the lasting operations to be performed on the article *k* of color *j (g = 1, 2, 3, …, L)*

t = index referring to the hand stitching operations performed on the article *k* of color *j (t = 1, 2, 3, …, u)*

v = index referring to the molding operations performed on the article *k* of color *j (v = 1, 2, 3, …, w)*

x = index referring to the job work operations performed on the article *k* of color *j (x = 1, 2, 3, …, y)*

P = index referring to the number of ordered sizes in the article *k* of color *j (P = 1, 2, 3, …, D)*

Parameters

N = Number of pairs of article *k* of color*j* and size *P*

EQ = estimated required quantity of the item *h*, *i* to be used in the article *j* of color *k*

C= cost of the item *h, i* to be used in article *k* of color *j*

ELMC = estimated cost of leather items *h* to be used in the article *k* of color *j*

ESMC = estimated cost of shoe material items *h* other than leather to be used in the article *k* of color *j*

ETMC = total estimated material cost of the article *k* or color *j*

Cs = cost/second paid to the employee for producing an article *k* of color *j*

ECC = total estimated cost of cutting operations performed on article *k* of color *j*

ESC = total estimated cost of all stitching operations performed on article *k* of color *j*

ELC = total estimated cost of all lasting operations performed on article *k* of color *j*

EMC = total estimated cost of all molding operations performed on article *k* of color *j*

EHSC = total estimated cost of all hand stitching operations performed on article *k* of color *j*

EJWC = total estimated cost of all job work operations performed on article *k* of color *j*

ETLC = total estimated labor cost for article *k* of color *j*

ET = estimated time (sec) taken by an operation (cutting, stitching, lasting, job work, molding) on the article *k* of color*j*

O = factory overheads

SAD = selling and administration cost for producing k^{th} article of j^{th} color

ZT = zakat tax for the produced k^{th} article of j^{th}color

LTC = cost of leather testing of k^{th} article of j^{th} color

TO = Total overheads for k^{th} article of j^{th} color

D = cost of cutting dies ordered for producing k^{th} article of j^{th} color

LS = cost of lasts produced for producing k^{th} article of j^{th} color

M = cost of molds produced for producing k^{th} article of j^{th} color

CDC = total cost of dies used for k^{th} article of j^{th} color

LSC = Total cost of lasts produced for k^{th} article of j^{th} color

MDC = Total cost of molds produced for k^{th} article of j^{th} color

TTC= total tooling cost incurred on k^{th} article of j^{th} color

OV = Order volume incurred on k^{th} article of j^{th} color

BPP = B-pair percentage incurred on k^{th} article of j^{th} color

BPC = B-pair cost incurred on k^{th} article of j^{th} color

ETC = Total estimated cost incurred on k^{th} article of j^{th} color

ELCPP = estimated labor cost per pair incurred on k^{th} article of j^{th} color

EMCPP = estimated material cost per pair incurred on k^{th} article of j^{th} color

OPP = overheads per pair incurred on k^{th} article of j^{th} color

TCPP = tooling cost per pair incurred on k^{th} article of j^{th} color

BPCPP = B-pair cost per pair incurred on k^{th} article of j^{th} color

ETCPP = total estimated cost per pair incurred on the article *k*

6.1. Total Number of Pairs

Order consists of different articles of different sized and leather colors; at the very first, a total number of pairs in each article *k*, of the size of *j* and color of *P* is calculated by the use of Equation (1).

$$OV = \sum_{k=1} \sum_{P=1}^{D} \sum_{j=1}^{m} N_{jPk} \tag{1}$$

6.2. Estimated Material Cost

Companies are needed to carry out the production at competitive prices and manage their costs systematically because of global completion and cost pressures (Keramatpanah et al., 2016). Material is the most important element the usage of which is highly essential to be managed and controlled. Extra material usage, defective production, and material wastage lead to increased material costs.

Material for shoe manufacturing is mainly categorized into two categories i.e. leather material and shoe material. Most of the components of the shoe upper (vamp, mudguard, chakwa, quarters, heel grip, back loops, eyelet parts, tongue, and lining, etc.) are made from leather. Initially, the leather components of the article (shoe) are traced on the graph paper with the help of patterns of various components of articles. Since the area is the physical quantity for the measurement of leather that is why the cost of leather is estimated per square foot; with the help of Eq. (2), cost of leather is calculated for leather component *i* of article color *j* of article *k*.

$$ELMC = \sum_{k=1} \sum_{j=1}^{m} \sum_{i=1}^{n} (EQ_{ijk} \mathrm{x} C_{ijk}) \tag{2}$$

Other than leather upper, there are various other components i.e. sole, in-socks, socks, laces, eyelets, etc. which are combined to manufacture footwear articles. The cost of items (*h*) other than leather can be calculated by the help Eq. (3).

$$ESMC = \sum_{k=1} \sum_{j=1}^{m} \sum_{h=1}^{p} (EQ_{hjk} \mathrm{x} C_{hjk}) \tag{3}$$

On summing up the estimated leather material cost (ELMC) and estimated shoe material cost (ESMC), the total estimated material cost (ETMC) is calculated given in Eq. (4).

$$ETMC = (ELMC + ESMC) \tag{4}$$

Since the basic unit of footwear article (shoe) is a pair. Thus, the estimated material cost per pair (EMCPP) is calculated with the help of Eq. (5).

$$EMCPP = \frac{ETM_c}{OV} \tag{5}$$

6.3. Estimated Labor Cost

Economists have always faced the dilemma in carrying out conceptual and empirical work on labor cost: Data capable of supporting tests of sophisticated theoretical propositions are often inaccessible or non-existent (Antos, 1983). Indeed some of the SMEs (small and medium-scale enterprises) face difficulty when determining the production cost and their calculated cost usually indicated underpricing or over-pricing (Howard et al., 2019). Every employer is concerned about labor costs—i.e. higher wage rates and employee benefits. An attractive package is essential for inducing people to apply for jobs and to work hard, but it will also be subtracted from the employer's revenue and thus reduce profits (Hamermesh, 2014). There are various stages of shoe manufacturing (cutting, stitching, hand stitching, lasting, Job work, and molding) in which there is the need for labor cost. Equations from (6) to (11) are used for the calculation of labor cost at various stages of shoe manufacturing.

6.3.1. Estimated Cutting Cost

Leather material, fusing cloth, the foam used in lining, elastic, etc. materials to be used in the shoe manufacturing are cut on the cutting press with the help of already designed cutting dies. At the time of cutting the components, a time study of each operation is conducted.

$$\mathrm{ECC} = \sum_{k=1} \sum_{j=1}^{m} \sum_{o=1}^{q} (ET_{ojk} \mathrm{x}\, Cs) \tag{6}$$

It is not only footwear upper cutting but there are post-cutting operations as well i.e. skiving, stamping, splitting, marking, and embossing which are performed on each of the components. The time of these all operations is also recorded with the help of a stopwatch. The collective time of cutting with all required operations as mentioned above is termed as the total cutting time of an article *k* of color *j* which can be calculated by the use of (6).

6.3.2. Estimated Stitching Cost

When the whole material of an article is cut, it is then dispatched to the stitching department where all the cut parts are assembled to make a shoe upper (show without sole). In upper stitching, the operations and their time study vary from article to article.

$$ESC = \sum_{k=1} \sum_{j=1}^{m} \sum_{s=1}^{r} (ET_{sjk} \mathrm{x}\, Cs) \tag{7}$$

The time of each operation *s* of the stitching section is recorded and the sum of time of all the operations is called the stitching time of an article *k* as can be calculated by (7).

6.3.3. Estimated Hand Stitching Cost

Post bed single needle, double needle, and various other stitching machines are used in the stitching department but due to the requirement of particular articles, their chakwa/vamp is stitched via hand stitching.

$$\mathrm{EHSC} = \sum_{k=1} \sum_{j=1}^{m} \sum_{t=1}^{u} \left(ET_{tjk} \mathrm{x}\, Cs\right) \tag{8}$$

This operation is outsourced because the hand stitching work is not usual in the day-to-day orders. The time of each operation is noted and the contractors are paid accordingly. The cost of the hand stitching of an article is calculated by (8).

6.3.4. Estimated Molding Cost

The molding section is supposed to mold the soles of different articles. The cost of molding an article is calculated by (9).

$$\mathrm{EMC} = \sum_{k=1} \sum_{j=1}^{m} \sum_{v=1}^{w} (ET_{vjk} \mathrm{x}\, Cs) \tag{9}$$

When the soles are molded, they are dispatched to the lasting department thereafter for the lasting of the article.

6.3.5. Estimated Lasting Cost

Lasting is the section of shoe manufacturing in which the sole is attached to the shoe upper. Lasting consists of the series of operations (*g*). In this section, the shoe is finished and packed into boxes.

$$\mathrm{ELC} = \sum_{k=1} \sum_{j=1}^{m} \sum_{g=1}^{L} (ET_{gjk} \mathrm{x}\, Cs) \tag{10}$$

The time of all the operations is recorded and is called the lasting time of an article; which can be calculated by (10).

6.3.6. Total Estimated Labor Cost

The addition of estimated cutting, stitching, hand stitching, molding, and lasting costs is called the total estimated labor cost as given in (11).

$$ETLC = (\mathrm{ECC} + ESC + ELC + EMC + EHSC) \tag{11}$$

The total estimated labor cost per pair can be calculated by (12).

$$ELCPP = \frac{ETLC}{OV} \tag{12}$$

6.4. Overheads

Generally, overheads are calculated by summing up the indirect labor cost, expenses, and indirect material costs (Choudhary, 2010). The addition of factory overheads (O), administration and selling cost (SAD), zakat tax (ZT), and the cost of leather testing are termed as the total overheads.

$$TO = \sum_{k=1} \left(O_k + SAD_k + ZT_k + LT_{ck}\right) \tag{13}$$

Total overheads per pair can be calculated by (14).

$$OPP = \frac{TO}{OV} \tag{14}$$

6.5. Tooling Cost

The required tools for the manufacturing of shoes are cutting dies/knives, shoe lasts, and molds. The cost of each of the tools is calculated in the below-given equations.

6.5.1. Cost of Cutting Dies

Manufacturing of cutting dies is outsourced from already selected vendors. Cutting Dies/knives (made of steel) are manufactured as per the shapes of different components of the articles. Cutting Dies/knives (*a*) are manufactured for each of the size (*P*) of the specific article. Their cost can be calculated by (15).

$$CDC = \sum_{k=1} \sum_{P=1}^{D} D_{Pk} \tag{15}$$

6.5.2. Cost of Lasts

Lasts are put in the shoe upper when the lasting operations are performed thereof. The cost of lasts can be calculated by (16).

$$LSC = \sum_{k=1} \sum_{P=1}^{D} LS_{Pk} \tag{16}$$

6.5.3. Cost of Molds

Molds (*e*) are used for making the sole of an article (*k*) of size (*P*). The molding cost for an article can be calculated by (17).

$$MDC = \sum_{k=1} \sum_{P=1}^{D} M_{Pk} \tag{17}$$

6.5.4. Total Tooling Cost

Total tooling cost can be calculated by adding, cost of cutting dies, cost of lasts, and cost of molds together as by (18).

$$TTC = (CDC + LSC + MDC) \tag{18}$$

Tooling cost per pair can be calculated with the help of eq. (19).

$$TCPP = \frac{TTC}{OV} \tag{19}$$

6.6. Cost of B-pair

In every industry, the cost of defective products is always included in the total cost of an article. The percentage of b-pairs varies from company to company. It is calculated by multiplying the b-pair percentage (BPP) with the cost of shoe material as given in (20).

$$BPC = \sum_{k=1}^{m} \sum_{j=1}^{p} \sum_{h=1} (EQ_{hjk} \mathrm{x} C_{hjk}) \mathrm{x}\ BPP \tag{20}$$

B-pair cost per pair can be calculated by (21).

$$BPCPP = \frac{BPC}{OV} \tag{21}$$

6.7. Estimated Total Cost

Since, the footwear industry is one of those industries, in which the manufacturing processes for every order are different, especially in the stitching section. The stitching processes to be performed on the leather upper change with the nature and design of the article (i.e. sports shoes, long shoes, casual shoes, Slippers, etc.). Since the operations vary with the design and nature of the article; thus, the time consumed on those operations will also vary. Process time variation is associated with the labor cost and the labor cost is viewed as the total cost for employing labor in the firm for the production of goods (Antos, 1983). On increasing labor costs, instant options for employers are either to absorb the extra cost or downsize the firm (Hamermesh, 2014).The sum of estimated total material cost, estimated total labor cost, total overheads, total tooling cost, and the b-pair cost is termed as the estimated total cost as given in (22).

$$ETC = (ETMC + ETLC + TO + TTC + BPC) \tag{22}$$

$$TCPP = \frac{ETC}{OV} \tag{23}$$

The estimated total cost per pair of an article can be calculated by (23).

7. Existing Method for Making Order Costing Report

In small and medium business enterprises, Microsoft Excel is a major application used for the reporting purpose even if, there is the facility of enterprise resource planning software. Similarly, in the case of a company (medium enterprise), Microsoft Excel has been used as the office reporting application. Table 1 represents the series of manual activities needed to make the order costing report in Microsoft Excel. The activities to make the order costing report of articles *k* of colors j include the same activities; that's why the repeated activities are avoided to be mentioned. Table 1 contains activities to make the report of only one article with only one color.

Table 1: Time study of the various tasks which are performed to make the order costing report.

Notations	Obs.1 (Sec)	Obs.2 (Sec)	Obs.3 (Sec)	Obs.4 (Sec)	Obs.5 (Sec)	Obs.6 (Sec)	Obs.7 (Sec)	Obs.8 (Sec)	Obs.9 (Sec)	Obs.10 (Sec)	Mean Time (Sec)
b1	47.7	39.54	43.86	47.08	39.04	31.23	41.43	43.63	43.92	40.05	41.748
b2	12.92	12.81	6.89	7.84	8.86	15.83	11.94	13.7	13.91	15.29	11.999
b3	8.25	10.41	8.13	9.34	10.2	8.27	12.91	10.52	10.46	7.8	9.629
b4	6.4	5.94	6.07	6.99	8.58	5.6	4.89	6.96	5.41	6.38	6.322
b5	5.47	6.21	6.75	7.88	7.1	7.5	5.63	4.14	4.96	7.61	6.325
b6	21.39	21.58	20.88	20.4	18.68	18.72	22.44	19.07	22	16.39	20.155
b7	5.47	6.21	6.75	7.88	7.1	7.5	5.63	4.14	4.96	7.61	6.325
b8	2.6	2.57	2.88	3.81	2.45	4.91	3.68	2.7	3.8	3.08	3.248
b9	5.02	5.07	3.05	5.03	5.38	4.76	4.4	5.99	4.65	4.89	4.824
b10	12.46	10.2	11.88	10.84	9.37	8.05	11.17	10.93	8.59	11.5	10.499
b11	76.19	45.65	62.49	68.12	78.66	60.97	73.25	74.03	78.86	66.21	68.443
b12	29.48	36.18	36.94	22.31	35.98	28.54	26.93	22.82	36.92	26.14	30.224
b13	39.95	41.67	34.51	39.67	40.62	42.9	38.14	41.3	34.72	41.31	39.479
b14	13.74	13.68	18.15	13.64	16.08	13.58	14.07	14.29	17.39	14.28	14.89
b15	4.66	3.92	7.26	5.16	4.14	5.24	6.23	6.18	5.47	4.5	5.276
b16	6.17	7.74	7.08	5.99	6.09	5.35	6.22	5.58	7.93	7.97	6.612
b17	2.88	4.9	4.1	3.37	3.1	3.3	5.06	3.87	4.08	4.76	3.942
b18	3.15	3.07	2.9	2.04	2.12	3.7	3.05	2.72	2.64	2.18	2.757
b19	9.33	17.2	13.11	16.84	17.4	20.38	13.67	16.13	12.75	14.97	15.178
b20	16.28	16.67	16.93	16.77	17.04	17.97	14.81	14.07	12.46	13.11	15.611
b21	2.42	3.04	2.5	2.12	2.35	2.56	2.78	3.56	2.18	2.56	2.607
b22	1.99	1.75	2.17	1.82	1.95	2.12	2.02	1.91	1.54	1.76	4.787
b23	14.94	10.65	16.9	11.91	14.19	12.98	10.63	9.8	10.75	12.15	12.49
b24	65.46	72.27	49.01	58.26	65.66	44.69	68.64	61.28	71.17	55.74	61.218
b25	14.74	18.09	18.47	11.155	17.99	14.27	13.465	11.41	18.46	13.07	15.112
b26	4.93	5.84	5.83	5.52	4.67	4.93	4.98	6.52	4.3	5.05	5.257
b27	4.93	5.84	5.83	5.52	4.67	4.93	4.98	6.52	4.3	5.05	5.257
b28	5.53	3.61	4.64	4.57	4.5	4.24	6	5.72	5.21	3.85	4.787
b29	12.17	10.72	12.52	11.72	10.93	9.88	12.45	11.64	11.55	12.97	11.655
b30	4.3	6.76	6.17	6.56	4.87	4.93	7.63	6.27	4.78	5.56	5.783
b31	5.77	4.41	5.91	4.36	6.46	5.27	5.86	5.27	4.84	6.63	5.478
b32	5.78	4.9	3.61	6.97	4.66	5.61	5.04	6.57	6.79	3.76	5.369
b33	2.56	2.57	3.01	2.61	3.47	2.98	2.79	1.12	3.2	2.07	2.638
b34	267.01	218.24	91.09	188.1	138.19	210.56	99.28	134.49	184.22	200.99	173.217
b35	47.38	47	51.65	44.15	47.41	47.39	51.84	45.77	49.76	45.82	47.817
b36	5.71	6.75	7.35	7.48	8.59	6.84	7.86	9.05	7.22	8.58	7.543
b37	11.25	11.19	9.98	7.83	9.38	8.75	6.55	8.12	7.19	9.78	9.002
b38	6.51	9.21	9.36	4.72	10.1	7.54	8.47	6.79	12.69	12.62	8.801
b39	51.93	76.83	69.49	57.22	55.12	52.08	47.92	64.08	79.6	71.91	62.618
b40	62.73	88.8	46.13	49.79	77.06	62.37	63.27	46.5	51.17	67.51	61.533
b41	79.51	66.81	71.1	59.42	56.65	65.48	58.89	73.12	69.64	60.29	66.091
b42	5.49	9.09	5.7	5.81	7.28	4.35	5.65	8.21	6.43	6.57	6.458
b43	4.72	4.26	5.3	4.67	4.01	5.05	4.3	31.92	4.1	5.21	7.354
b44	10.28	7.97	9.37	9.08	10.41	9.42	6.86	9.96	8.81	6.28	8.844
b45	82.08	108.17	95.47	144.49	96.68	149.99	114.08	111.58	134.88	134.23	117.165
Total Time											1042.367

Notations

b1 = Download transaction from Microsoft Dynamics AX into Microsoft Excel

b2 = Filter Warehouse column `G` with “EXP WH”, “Lthr SMP” and “FWH”

b3 = Delete Filtered rows

b4 = Remove Autofilter mode

b5 = Insert column ‘B’ and put a header on it (Item)

b6 = Merge item number (C) + configuration (B) + size (D) + color (E) by =concatenate formulae

b7 = Copy all the values of merge columns and paste as values in the same column

b8 = Delete columns from C:D

b9 = Delete values from E and F column

b10 = Put headers on the E and F column 'Article' and 'Color' respectively.

b11 = open the workbook containing the sale order detail

b12 = Apply =vlookup formulae and put the article (C) and color (D) against the prod#

b13 = Convert the data (A:F) into a pivot table

b14 = Copy all the data from the pivot table and paste it next to it

b15 = Delete the pivot table

b16 = Delete the last row of pasted data containing Grand Total

b17 = Insert row and put the color of the article at the top

b18 = Merge three cells to the right on the same row

b19 = Put Headers on the columns (Item, quantity, cost/item, total cost)

b20 = Insert above two rows for putting the article name and its ordered pairs

b21 = Insert one row below the headers

b22 = Merge the cells below the headers to put the number of pairs of an article on the specific color

b23 = Put the pairs of the article of the required color

b24 = Open the workbook containing the costs of all items

b25 = Apply =vlookup to pick the cost of each item present in another work

b26 = Calculate the consumption of item per pair

b27 = Calculate the total cost of each item required for the article

b28 = Put the sub totals for leather material cost

b29 = Put the totals for the Overall material cost of the article of the specific color

b30 = Put the interior color in the headers` row and make its font bold

b31 = Put the interior color in the row of sub totals and make its font bold

b32 = Put the interior color in row Totals and make its font bold

b33 = Make the article bold, along with its pairs

b34 = Make up the data backup of this report for post-order analysis

b35 = Copy and paste the format of summary in the summary worksheet of the report

b36 = Put Sale price/pair

b37 = Put total leather cost of each article

b38 = Put total shoe material cost of each article

b39 = Put total labor cost of each article

b40 = Put total tooling cost of each article

b41 = Put the overheads of each article

b42 = Put B-Pair Cost of each article

b43 = Calculate cost/pair for all the individual sub totals of each article

b44 = Calculate the total cost and total cost/pair of each article

b45 = Put the picture of the article

The order costing report of only one article having one color used to take 1042.367 s (17.37 min). With the help of activities given in Table 1, the time to make the order costing report can be estimated. Figure1 represents the mean time incurred on the activities.

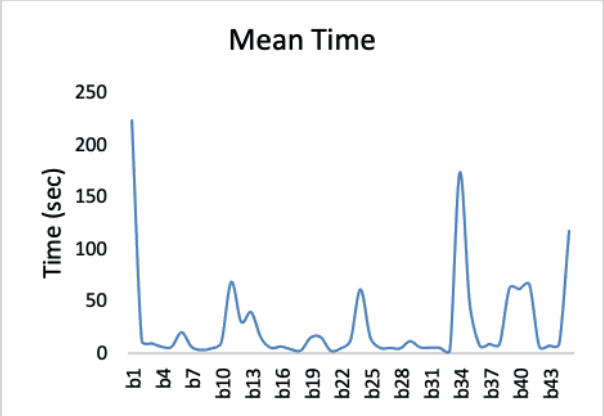


Figure 1: Mean time the various tasks which are performed to prepare the order costing report.

8. Suggested Method for Preparation of Order Costing Report

Because of manual reporting in Microsoft Excel, a lot of time was used to be spent on the formation of reports, and the purchasing department used to wait because of many order costing reports in the queue. Since, waiting cost is associated with queues (Kalwar et al., 2018; Kalwar, Mari, et al., 2020; Kalwar, Marri, Khan, et al., 2021; Kalwar, Memon, et al., 2021; Khan, Khaskheli, et al., 2021a, 2021b; Khaskheli et al., 2020), thus it was decided to automate the order costing report. The procedure to make an order costing report was manual e.g. organization of data, its calculation, and the report formation. Because of manual procedure, there was a greater chance of error. At the same time, doing repetitive tasks and error correction leads to the employees` frustration and irritation. Because of the above-mentioned reasons, the order costing

report was targeted for automation. Two userforms were designed to execute the macros behind the automation of the targeted report.

Userform can be opened by pressing **Ctrl + q**.When this form appears, the user is required to select (options given in the combo-box) the type of report he wants to make and click the command button 'Go'; it will lead the user to another form given in Figure 2.

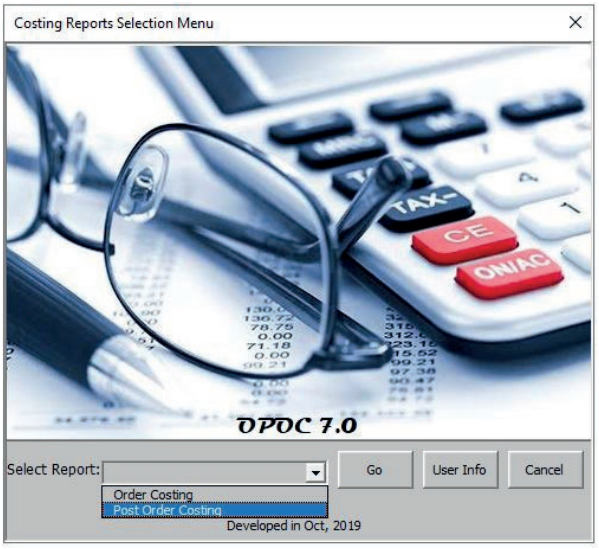


Figure 2: Userform leading to the commands (macros) for making the order costing report.

Userform presented in Figure 3 consists of the command buttons having macros at their back which can be executed with just one click.

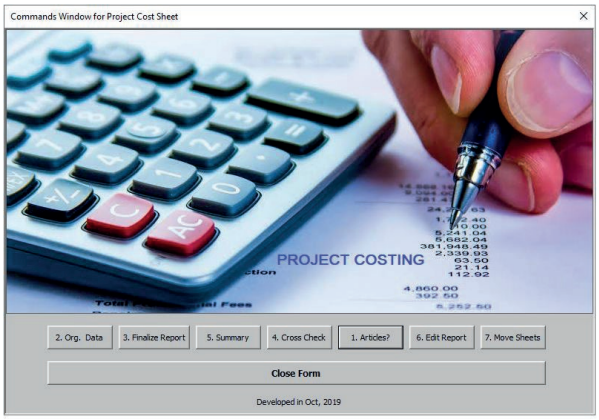


Figure 3: Commands menu for preparation of the order costing report.

8.1. Worksheets in the File and Their Purpose

The automated template made for the order costing report consists of nine worksheets as shown in Table 2. In 'Raw Data' Worksheet. 'Articles' worksheets are used for data calculation. The data which is used to be fetched up is put into 'Sale Order Detail', `Mat Price List`, and `LOH` worksheets. In the 'Cross Check' worksheet, the non-availability of the price of any material used in the articles is checked during the formation of the report.

Table 2: Worksheets required for the preparation of automated order costing report.

Sr. #	Name of the Worksheet
1	Summary
2	Raw Data
3	Cross Check
4	Articles
5	Sale Order Detial
6	Mat Price List
7	LOH
8	Transaction Backup
9	PCS Final Result

In the 'LOH' worksheet, the data regarding the labor cost, overheads, molding, and tooling cost is already entered. In 'Transaction Backup', the backup of the basic data as given in Figure 5 is kept automatically with the help of the VBA macro. In the 'PCS Final Result' worksheet, the data obtained from the order costing report is automatically converted into the required format so that it can be used in the post-order costing report. In the 'Summary' worksheet, the summary of the order costing report is calculated with the help of VBA macros.

8.2. Basic Data for Order Costing

At the very first, the data regarding the specific order is obtained from the Microsoft Dynamics AX by putting the specific range of production numbers. The data which is obtained has the fields and structure like the data is presented in Figure 4.

8.3. Take Out the Articles and Their Colors

The flowchart in Figure 5 explains the visual basic for application (VBA) code for taking out the articles, their colors along with their quantities. Firstly, items are filtered having the description i.e. shoe box. All the filtered rows are copied to the 'Articles' worksheet and in the active sheet, the range of columns (B:E) is deleted. The '-' sign with the quantity is replaced with the blanks; then the range of columns (B:C) is inserted. Headers are put on the columns and with the help of for loop the article numbers and their colors are put in columns B and C by the applying '=vlookup' formula.

The whole data is converted to the pivot table and the articles and colors are copied from the pivot table thereafter as can be seen in Figure 6.

The pivot table is deleted manually by the user himself. The article numbers, article colors, and total pairs of each of the articles are put in the last column headed with a total.

	A	B	C	D	E	F	G
1	Number	Configuration	Item number	Size	Color	Quantity	Warehouse
2	Prod_00173841	Cow	London Nbk	1.4-1.6 mm	Expresso	-2	Lthr Store
3	Prod_00173841	Cow	Split Sued	1.2-1.4 mm	Expresso	-0.44	Lthr Store
4	Prod_00173841	SyntSkLing	Syntc Socks Lining	Default	D/Brown	-0.04	Shoe Mat
5	Prod_00173841	SyntSkLing	Syntc Socks Lining	Default	D/Brown	-0.04	Shoe Mat
6	Prod_00173841	Buff	Lining Snuffed veg	0.7-0.9 mm	T.Moro	-0.39	Lthr Store
7	Prod_00173841	ClothFurLn	Cloth Fur Lining	Default	Beige	-0.14	Shoe Mat
8	Prod_00173841	ClothFurLn	Cloth Fur Lining	Default	Beige	-0.06	Shoe Mat
9	Prod_00173841	RbrFomSock	Rubber Foam Socks	3 mm	Beige	-0.05	Shoe Mat
10	Prod_00173841	ShetStobal	Stobal	Default	White	-0.05	Shoe Mat
11	Prod_00173841	LablSokTra	Socks Label Trappeur	Default	BlkGryOrng	-2	Shoe Mat
12	Prod_00173841	WovnLabel	Woven Label Made in Pakistan	Default	White/Blk	-2	Shoe Mat
13	Prod_00173841	EvaSpunchF	Eva With Spunch Foam	2+10 mm	Beige&Grey	-0.03	Shoe Mat
14	Prod_00173841	Foam	Foam	4mm	White	-0.01	Shoe Mat
15	Prod_00173841	ShetToePuf	Sheet ToePuf 21	0.6 mm	White	-0.02	Shoe Mat
16	Prod_00173841	ShetToePuf	Sheet ToePuf 25	0.8 mm	White	-0.02	Shoe Mat
17	Prod_00173841	Cloth	Crimping Cloth Local	Default	White	-0.03	Shoe Mat
18	Prod_00173841	ClothVmpWx	Vamp Cloth Waxed	Default	Off White	-0.03	Shoe Mat
19	Prod_00173841	ClothPerln	Perlon Cloth	Default	Black	-0.02	Shoe Mat

Figure 4: Transaction data required for the preparation of order costing report.

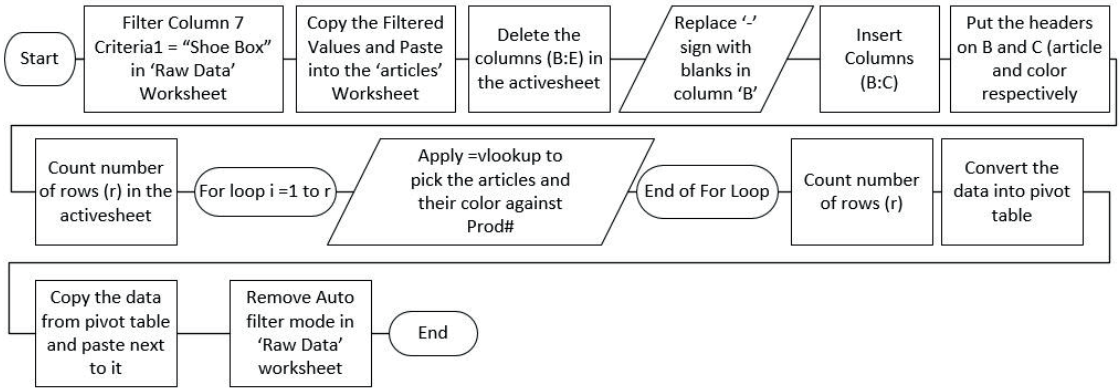


Figure 5: Process flowchart of the VBA code for taking out the articles, their colors along with their quantities.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Sum of Quantity	Column Labels						Row Labe	Brown	D/Blue	Expresso	Namibia	Navy	Grand Tot
2	Row Labels	Brown	D/Blue	Expresso	Namibia	Navy	Grand Total	2083 DBY				3		3
3	2083 DBY				3		3	2979 DBY		182				182
4	2979 DBY		182				182	3686 (VIV)			4489			4489
5	3686 (VIV)			4489			4489	4543 CFS	1496					1496
6	4543 CFS	1496					1496	4600 DBY					3	3
7	4600 DBY					3	3							
8	Grand Total	1496	182	4489	3	3	6173							

Figure 6: Result of VBA code as given flowchart of Figure 4.

8.4. Organization of Basic Data

After the articles are revealed along with their ordered colors and total quantities, the basic data (see Figure 6) is organized in the 'Raw Data' worksheet as per the requirement of the report. At the very first, the auto-filter mode is removed and the backup of the basic data is copied into the 'transaction backup' worksheet. The data is then filtered into the 'Raw Data' worksheet with multiple criteria i.e. 'EXP WH, Lthr SMP, FWH, and the filtered rows are deleted. Auto-filter mode is removed again and after inserting column B, four columns containing item number, configuration, size, and color are merged into column B with the help of for loop. Columns from C to F are deleted and the first row is inserted to put the headers. Negative sign from the values of quantity is removed and the article numbers and their colors are picked up from the 'Sale Order Detail' worksheet with the help of the '=vlookup' formula. All the data is converted into the pivot table and the whole data from the pivot table is copied and pasted next to it as can be seen in Figure 8.

The pivot table in Figure 8 is supposed to be deleted by the user himself to step ahead.

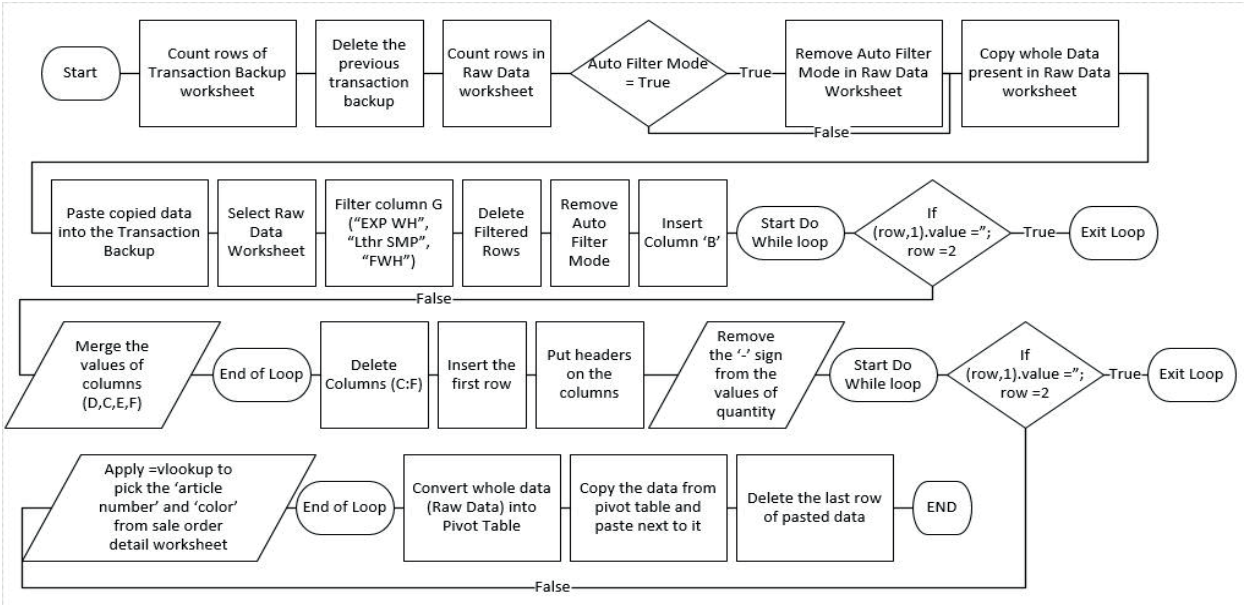
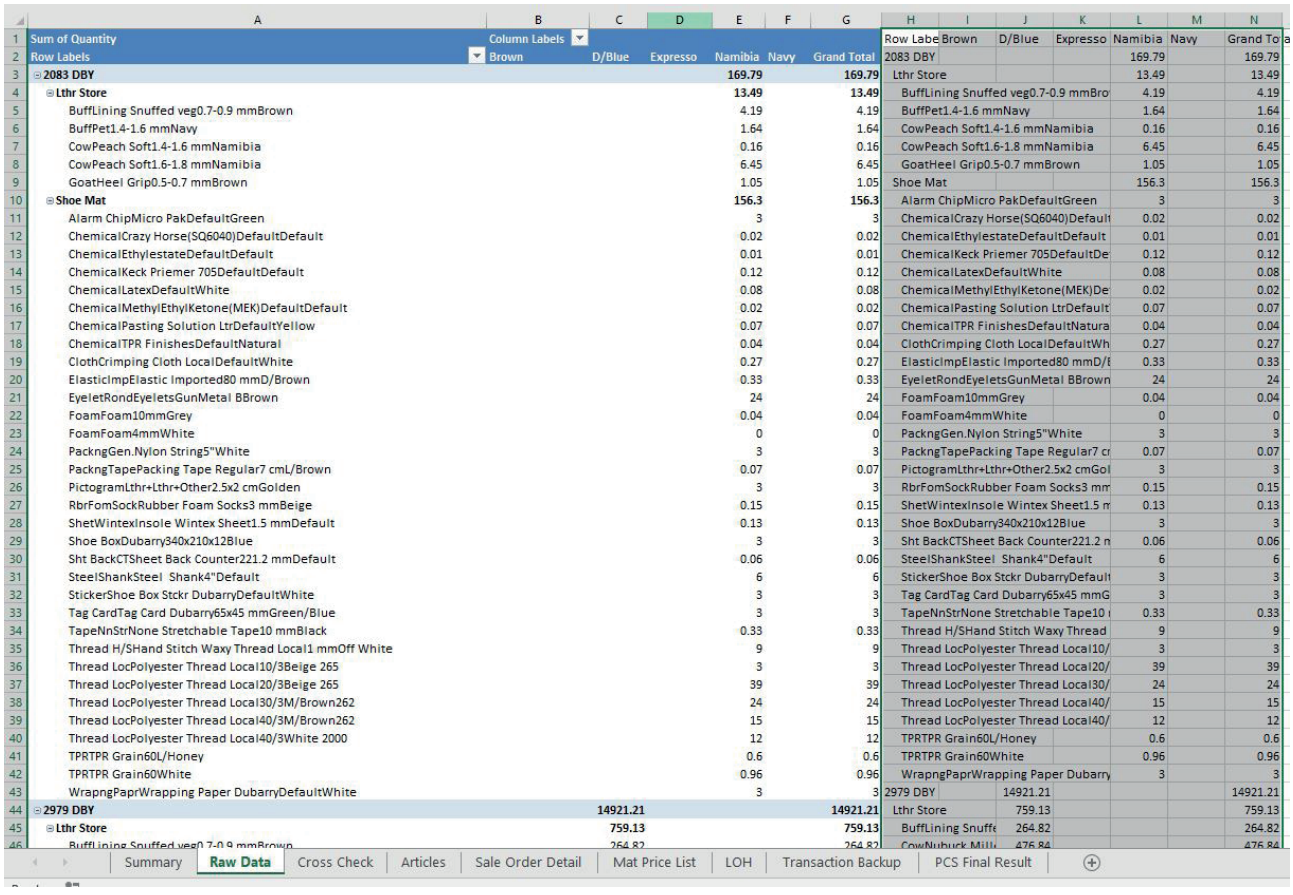


Figure 7: Flowchart representing the code for the organization of basic data.



Sum of Quantity	Column Labels					
Row Labels	Brown	D/Blue	Expresso	Namibia	Navy	Grand Total
2083 DBY				169.79		169.79
Lthr Store				13.49		13.49
BuffLining Snuffed veg0.7-0.9 mmBrown				4.19		4.19
BuffPet1.4-1.6 mmNavy				1.64		1.64
CowPeach Soft1.4-1.6 mmNamibia				0.16		0.16
CowPeach Soft1.6-1.8 mmNamibia				6.45		6.45
GoatHeel Grip0.5-0.7 mmBrown				1.05		1.05
Shoe Mat				156.3		156.3
Alarm ChipMicro PakDefaultGreen				3		3
ChemicalCrazy Horse(SQ6040)DefaultDefault				0.02		0.02
ChemicalEthylestateDefaultDefault				0.01		0.01
ChemicalKeck Priemer 705DefaultDefault				0.12		0.12
ChemicalLatexDefaultWhite				0.08		0.08
ChemicalMethylEthylKetone(MEK)DefaultDefault				0.02		0.02
ChemicalPasting Solution LtrDefaultYellow				0.07		0.07
ChemicalTPR FinishesDefaultNatural				0.04		0.04
ClothCrimping Cloth LocalDefaultWhite				0.27		0.27
ElasticImpElastic Imported80 mmD/Brown				0.33		0.33
EyeletRondEyeletsGunMetal BBrown				24		24
FoamFoam10mmGrey				0.04		0.04
FoamFoam4mmWhite				0		0
PackngGen.Nylon String5"White				3		3
PackngTapePacking Tape Regular7 cmL/Brown				0.07		0.07
PictogramLthr+Lthr+Other2.5x2 cmGolden				3		3
RbrFomSockRubber Foam Socks3 mmBeige				0.15		0.15
ShetWintexInsole Wintex Sheet1.5 mmDefault				0.13		0.13
Shoe BoxDubarry340x210x12Blue				3		3
Sht BackCTSheet Back Counter221.2 mmDefault				0.06		0.06
SteelShankSteel Shank4"Default				6		6
StickerShoe Box Stckr DubarryDefaultWhite				3		3
Tag CardTag Card Dubarry65x45 mmGreen/Blue				3		3
TapeNnStrNone Stretchable Tape10 mmBlack				0.33		0.33
Thread H/SHand Stitch Waxy Thread Local1 mmOff White				9		9
Thread LocPolyester Thread Local10/3Beige 265				3		3
Thread LocPolyester Thread Local20/3Beige 265				39		39
Thread LocPolyester Thread Local30/3M/Brown262				24		24
Thread LocPolyester Thread Local40/3M/Brown262				15		15
Thread LocPolyester Thread Local40/3White 2000				12		12
TPRTPR Grain60L/Honey				0.6		0.6
TPRTPR Grain60White				0.96		0.96
WrapngPaprWrapping Paper DubarryDefaultWhite				3		3
2979 DBY		14921.21				14921.21
Lthr Store		759.13				759.13

Row Labe	Brown	D/Blue	Expresso	Namibia	Navy	Grand To
2083 DBY				169.79		169.79
Lthr Store				13.49		13.49
BuffLining Snuffed veg0.7-0.9 mmBro				4.19		4.19
BuffPet1.4-1.6 mmNavy				1.64		1.64
CowPeach Soft1.4-1.6 mmNamibia				0.16		0.16
CowPeach Soft1.6-1.8 mmNamibia				6.45		6.45
GoatHeel Grip0.5-0.7 mmBrown				1.05		1.05
Shoe Mat				156.3		156.3
Alarm ChipMicro PakDefaultGreen				3		3
ChemicalCrazy Horse(SQ6040)Default				0.02		0.02
ChemicalEthylestateDefaultDefault				0.01		0.01
ChemicalKeck Priemer 705DefaultDe				0.12		0.12
ChemicalLatexDefaultWhite				0.08		0.08
ChemicalMethylEthylKetone(MEK)De				0.02		0.02
ChemicalPasting Solution LtrDefault				0.07		0.07
ChemicalTPR FinishesDefaultNatura				0.04		0.04
ClothCrimping Cloth LocalDefaultWh				0.27		0.27
ElasticImpElastic Imported80 mmD/E				0.33		0.33
EyeletRondEyeletsGunMetal BBrown				24		24
FoamFoam10mmGrey				0.04		0.04
FoamFoam4mmWhite				0		0
PackngGen.Nylon String5"White				3		3
PackngTapePacking Tape Regular7 cr				0.07		0.07
PictogramLthr+Lthr+Other2.5x2 cmGol				3		3
RbrFomSockRubber Foam Socks3 mm				0.15		0.15
ShetWintexInsole Wintex Sheet1.5 m				0.13		0.13
Shoe BoxDubarry340x210x12Blue				3		3
Sht BackCTSheet Back Counter221.2 n				0.06		0.06
SteelShankSteel Shank4"Default				6		6
StickerShoe Box Stckr DubarryDefault				3		3
Tag CardTag Card Dubarry65x45 mmG				3		3
TapeNnStrNone Stretchable Tape10 (				0.33		0.33
Thread H/SHand Stitch Waxy Thread				9		9
Thread LocPolyester Thread Local10/				3		3
Thread LocPolyester Thread Local20/				39		39
Thread LocPolyester Thread Local30/				24		24
Thread LocPolyester Thread Local40/				15		15
Thread LocPolyester Thread Local40/				12		12
TPRTPR Grain60L/Honey				0.6		0.6
TPRTPR Grain60White				0.96		0.96
WrapngPaprWrapping Paper Dubarry				3		3
2979 DBY		14921.21				14921.21
Lthr Store		759.13				759.13
BuffLining Snuffe		264.82				264.82
CowNubuck Milli		476.84				476.84

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Figure 8: The result of the code is represented by the flowchart given in Figure 5.

8.5. Cross Check the Material Prices

When leather and shoe material items are taken out for the different articles and their colors, it is necessary to verify that the prices of all items to be used in the manufacturing of different articles of different colors are available in the material price list.

All the items are transferred with the help of for loop in the 'Cross check' worksheet and the prices of items are picked up from the 'Mat Price List' by applying the '=vlookup' formula. When the prices of all the items are picked up, then those items are filtered which have no price value (see Figure 10).

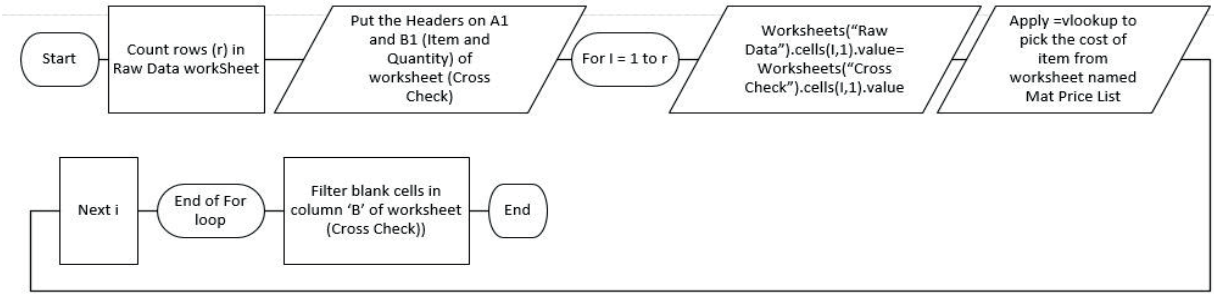

Figure 9: flowchart representing the code for cross-checking availability of the material prices of items in order costing report.

	A	B
1	Item	Rate
2	2083 DBY	
3	Lthr Store	
9	Shoe Mat	
43	2979 DBY	
44	Lthr Store	
48	Shoe Mat	
88	3686 (VIV)	
89	Lthr Store	
93	Shoe Mat	
163	4543 CFS	
164	Lthr Store	
167	Shoe Mat	
224	4544 CFS	
225	Lthr Store	
228	4600 DBY	
229	Lthr Store	
234	Shoe Mat	

Figure 10: Cross-checking of material prices as per the code represented by Figure 8.

8.6. Make the cells with Article Number Yellow and Keep Data Backup

The flowchart presented in Figure 11 represents the visual basic for applications code for putting the cell interior color as yellow (RGB (255, 255, 0)) and marking the font as bold wherever the value of the cell is 'Lthr Store' or 'Shoe Mat' in the first column. This whole process is conducted with the help of for loop executed as much as the number of rows present in the active worksheet i.e. Raw Data worksheet.

Soon after the completion of the above-discussed process, the last row of the active worksheet containing 'total' is deleted and the backup of data as can be seen in Figure 12 is copied to the 'cross check' worksheet; so that repetition of the already carried out process can be avoided.

8.7. Put Headers, Article Number, and Warehouse

Now it was necessary to put the headers, article numbers, and warehouse which will be used for putting final headers and totals in upcoming macros. The flowchart presented in Figure 13 is used for putting the article numbers, and warehouse as can be seen in Figure 14.

These all the processes were done with the help of for loop (see Figure 13).

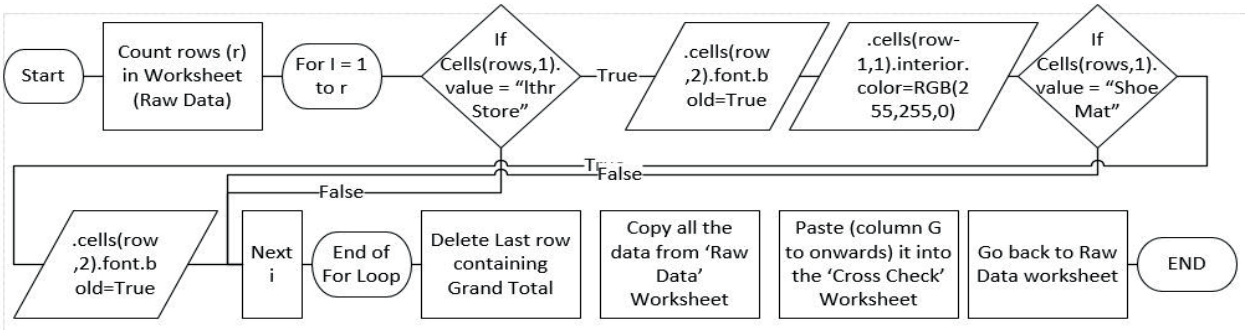

Figure 11: Flowchart representing the code for putting the interior color into the targeted cells and copying the data into another worksheet as a second backup.

	A	B	C	D	E	F	G	H	I
1	Row Labels	Brown	D/Blue	Expresso	Namibia	Navy	Grand Total		
2	2083 DBY				169.79		169.79		
3	**Lthr Store**				13.49		13.49		
4	BuffLining Snuffed veg0.7-0.9 mmBrown				4.19		4.19		
5	BuffPet1.4-1.6 mmNavy				1.64		1.64		
6	CowPeach Soft1.4-1.6 mmNamibia				0.16		0.16		
7	CowPeach Soft1.6-1.8 mmNamibia				6.45		6.45		
8	GoatHeel Grip0.5-0.7 mmBrown				1.05		1.05		
9	**Shoe Mat**				156.3		156.3		
10	Alarm ChipMicro PakDefaultGreen				3		3		
11	ChemicalCrazy Horse(SQ6040)DefaultDefault				0.02		0.02		
12	ChemicalEthylestateDefaultDefault				0.01		0.01		
13	ChemicalKeck Priemer 705DefaultDefault				0.12		0.12		
14	ChemicalLatexDefaultWhite				0.08		0.08		
15	ChemicalMethylEthylKetone(MEK)DefaultDefault				0.02		0.02		
16	ChemicalPasting Solution LtrDefaultYellow				0.07		0.07		
17	ChemicalTPR FinishesDefaultNatural				0.04		0.04		
18	ClothCrimping Cloth LocalDefaultWhite				0.27		0.27		
19	ElasticImpElastic Imported80 mmD/Brown				0.33		0.33		
20	EyeletRondEyeletsGunMetal BBrown				24		24		
21	FoamFoam10mmGrey				0.04		0.04		
22	FoamFoam4mmWhite				0		0		
23	PackngGen.Nylon String5"White				3		3		
24	PackngTapePacking Tape Regular7 cmL/Brown				0.07		0.07		
25	PictogramLthr+Lthr+Other2.5x2 cmGolden				3		3		
26	RbrFomSockRubber Foam Socks3 mmBeige				0.15		0.15		
27	ShetWintexInsole Wintex Sheet1.5 mmDefault				0.13		0.13		
28	Shoe BoxDubarry340x210x12Blue				3		3		
29	Sht BackCTSheet Back Counter221.2 mmDefault				0.06		0.06		
30	SteelShankSteel Shank4"Default				6		6		
31	StickerShoe Box Stckr DubarryDefaultWhite				3		3		
32	Tag CardTag Card Dubarry65x45 mmGreen/Blue				3		3		
33	TapeNnStrNone Stretchable Tape10 mmBlack				0.33		0.33		
34	Thread H/SHand Stitch Waxy Thread Local1 mmOff White				9		9		
35	Thread LocPolyester Thread Local10/3Beige 265				3		3		
36	Thread LocPolyester Thread Local20/3Beige 265				39		39		
37	Thread LocPolyester Thread Local30/3M/Brown262				24		24		
38	Thread LocPolyester Thread Local40/3M/Brown262				15		15		
39	Thread LocPolyester Thread Local40/3White 2000				12		12		
40	TPRTPR Grain60L/Honey				0.6		0.6		
41	TPRTPR Grain60White				0.96		0.96		
42	WrapngPaprWrapping Paper DubarryDefaultWhite				3		3		
43	2979 DBY		14921.21				14921.21		
44	**Lthr Store**		759.13				759.13		
45	BuffLining Snuffed veg0.7-0.9 mmBrown		264.82				264.82		
46	CowNubuck Milled Plated1.6-1.8 mmD/Blue		476.84				476.84		

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Figure 12: The result produced by the code is represented in Figure 11.

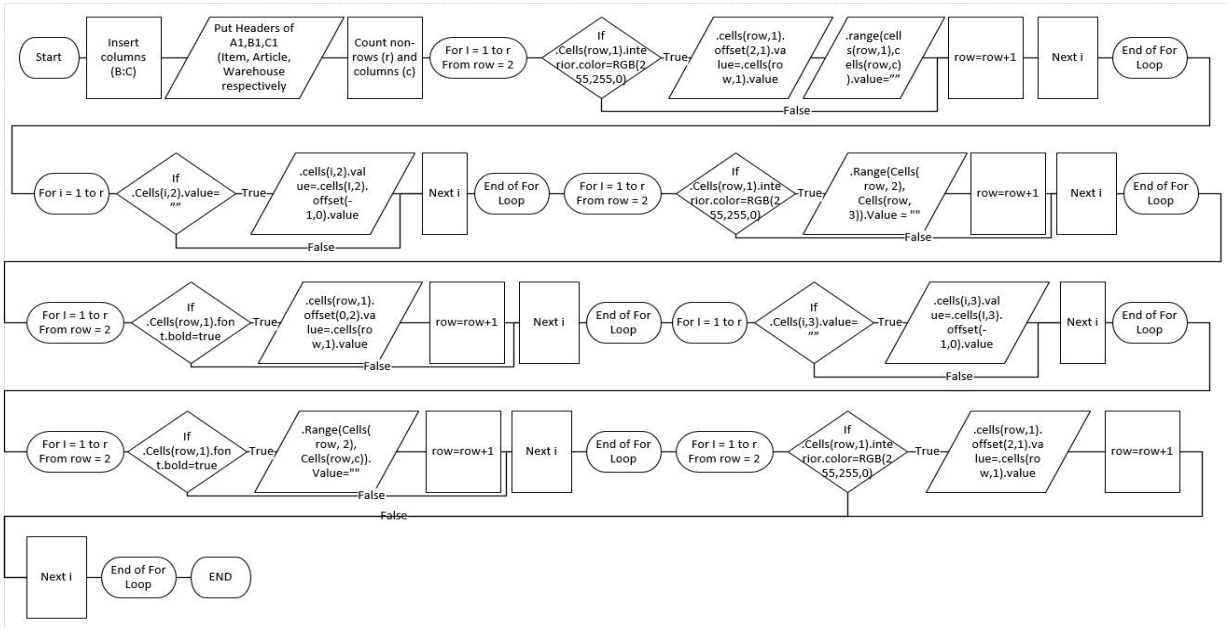

Figure 13: Flowchart representing the code for further organization of data and for inserting the column containing warehouse.

8.8. Count Rows of Each Article

A macro which is represented by Figure 15 is used for counting the number of rows of leather and shoe material of each article with the help of 'countifs' function (see Figure 15).

The counted values are put into the 'Articles' worksheet against each article (see columns H and I in Figure 16). This data will help of totaling the leather and shoe material in upcoming macros.

	A	B	C	D	E	F	G	H	I	J
1	Item	Article	Warehouse	Brown	D/Blue	Expresso	Namibia	Navy	Grand Total	
2										
3	**Lthr Store**									
4	BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store				4.19		4.19	
5	BuffPet1.4-1.6 mmNavy	2083 DBY	Lthr Store				1.64		1.64	
6	CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store				0.16		0.16	
7	CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store				6.45		6.45	
8	GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store				1.05		1.05	
9	**Shoe Mat**									
10	Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat				3		3	
11	ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat				0.02		0.02	
12	ChemicalEthylestateDefaultDefault	2083 DBY	Shoe Mat				0.01		0.01	
13	ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat				0.12		0.12	
14	ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat				0.08		0.08	
15	ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat				0.02		0.02	
16	ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat				0.07		0.07	
17	ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat				0.04		0.04	
18	ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat				0.27		0.27	
19	ElasticImpElastic Imported80 mmD/Brown	2083 DBY	Shoe Mat				0.33		0.33	
20	EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat				24		24	
21	FoamFoam10mmGrey	2083 DBY	Shoe Mat				0.04		0.04	
22	FoamFoam4mmWhite	2083 DBY	Shoe Mat				0		0	
23	PackngGen.Nylon String5"White	2083 DBY	Shoe Mat				3		3	
24	PackngTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat				0.07		0.07	
25	PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat				3		3	
26	RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat				0.15		0.15	
27	ShetWintexInsole Wintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat				0.13		0.13	
28	Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat				3		3	
29	Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat				0.06		0.06	
30	SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat				6		6	
31	StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat				3		3	
32	Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat				3		3	
33	TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat				0.33		0.33	
34	Thread H/SHand Stitch Waxy Thread Local1 mmOff White	2083 DBY	Shoe Mat				9		9	
35	Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat				3		3	
36	Thread LocPolyester Thread Local20/3Beige 265	2083 DBY	Shoe Mat				39		39	
37	Thread LocPolyester Thread Local30/3M/Brown262	2083 DBY	Shoe Mat				24		24	
38	Thread LocPolyester Thread Local40/3M/Brown262	2083 DBY	Shoe Mat				15		15	
39	Thread LocPolyester Thread Local40/3White 2000	2083 DBY	Shoe Mat				12		12	
40	TPRTPR Grain60L/Honey	2083 DBY	Shoe Mat				0.6		0.6	
41	TPRTPR Grain60White	2083 DBY	Shoe Mat				0.96		0.96	
42	WrapngPaprWrapping Paper DubarryDefaultWhite	2083 DBY	Shoe Mat				3		3	
43										
44	**Lthr Store**									
45	BuffLining Snuffed veg0.7-0.9 mmBrown	2979 DBY	Lthr Store		264.82				264.82	
46	CowNubuck Milled Plated1 6-1.8 mmD/Blue	2979 DBY	Lthr Store		476.84				476.84	

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Figure 14: The result produced by the code is represented in Figure 13.

8.9. Insert Headers and Columns

For loop in the macro presented in the flowchart (see Figure 17) will run as much as the articles in the 'Articles' worksheet. In the macro, a variable called 'addrows' is used to move the loop downwards for inserting the 3 rows after each article data. At the same time, headers i.e. item description, pairs, color, and article are put before the starting of data of each article (see Figure 18).

Those cells containing the value = Article or warehouse, are merged with the empty cells below them (see Figure 18), their horizontal and vertical alignment is set to center. Furthermore, the colors of each article and 'Req. Qty' as header, below which the quantity of the color is to be put.

Moreover, 2 columns before and 4 columns after every color of an article are inserted in the 'Raw Data' worksheet as can be seen in Figure 18.

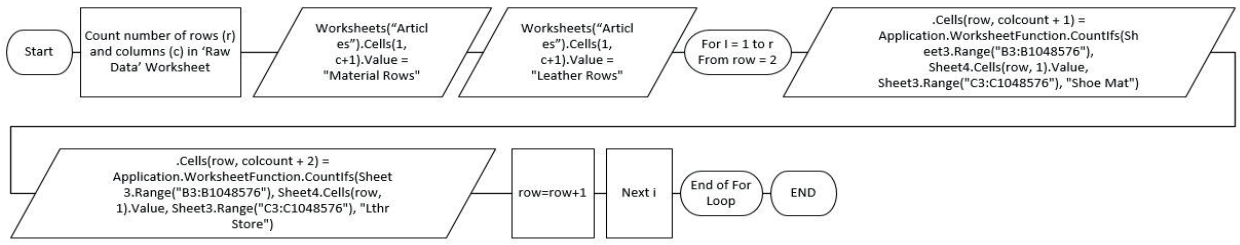

Figure 15: Flowchart representing the code for putting headers in the 'Raw Data' worksheet.

	A	B	C	D	E	F	G	H	I
1	Row Labe	Brown	D/Blue	Expresso	Namibia	Navy	Grand Tot	Material Rows	Leather Rows
2	2083 DBY				3		3	33	5
3	2979 DBY		182				182	39	3
4	3686 (VIV)			4489			4489	69	3
5	4543 CFS	1496					1496	56	2
6	4600 DBY					3	3	34	4

Figure 16: The result produced by the code is represented in Figure 15.

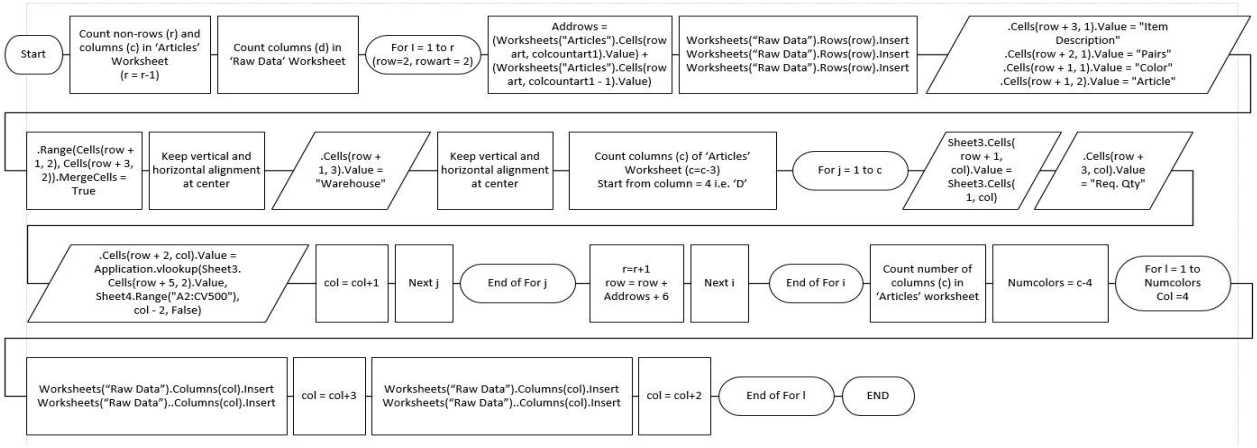

Figure 17: Flowchart representing the code for inserting the columns as the quantity of the colors in the specific order.

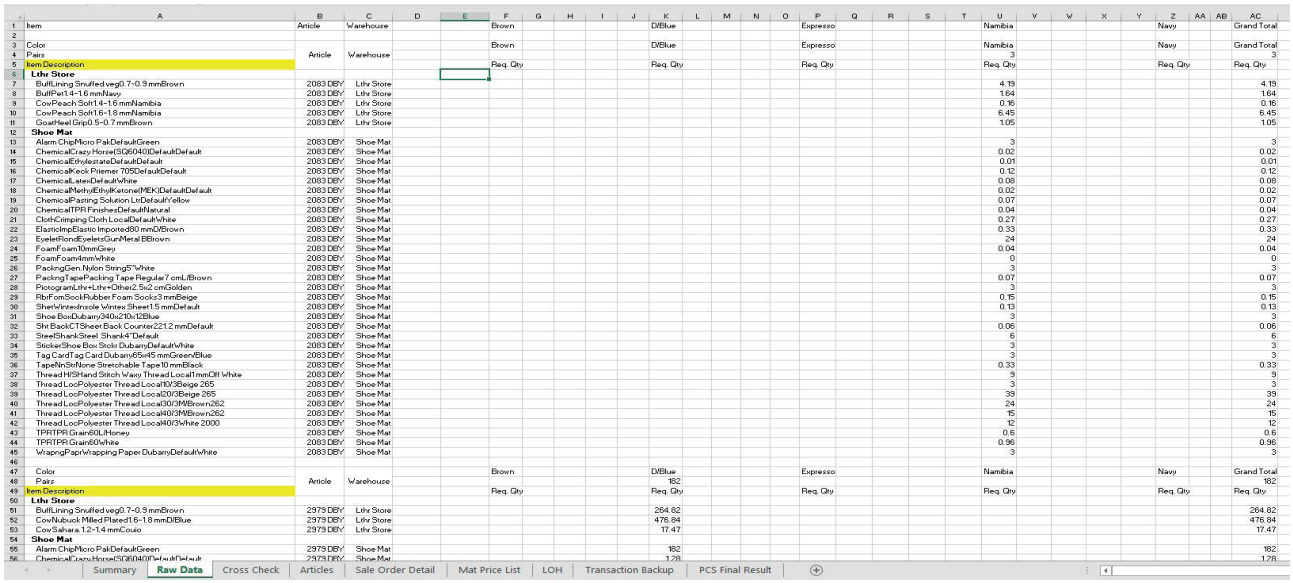

Figure 18: The result produced by the code is represented in Figure 17.

8.10. Put and Format the Headings of Each Article

The flowchart in Figure 19 represents the code that was used to put the headers on each color of each article which can be seen in Figure 20. For loop has been used in this code, the loop is executed as much as the number of articles in the 'Articles' worksheet. Variable i.e. addrows has been used for moving the loop down from article to article. The cells containing the color description and quantity were merged with the blank cells around them in the same rows (see Figure 20).

At the same time, cells containing headers are formatted by putting the interior color (RGB (1996, 215, 155)) and borders were formatted with continuous borders with thick weight as can be seen in Figure 20. Moreover, the horizontal and vertical alignment of the headers (of each article with each color) was set to the center.

8.11. Paste Pairs of Each Color of Each Article

The flowchart presented in Figure 21 represents the visual basic for applications (VBA) code by which the pairs of different colors of different articles are pasted. As the number of pairs given in T4 and J48 (see Figure 22) are pasted into S7 and I51 respectively as shown in Figure 22. For loop is used in the code represented by flowchart (given in Figure 21). A Variable called 'addrows' is used to move down from an article to an article for pasting the quantity.

The same procedure is repeated for all the colors of the articles in order.

8.12. Drag Pairs of Each Color of Each Article

After the quantity of pairs of each article is pasted, another macro is executed which is represented by the flowchart given in Figure 23. In the column i.e. 'Total Pairs' the for loop is executed to drag the pasted values in the can be seen in the highlighted columns (see Figure 24).

The same procedure is repeated for all the colors of the articles in order with the help of for loop execute as much as the number of rows in the 'Raw Data' worksheet.

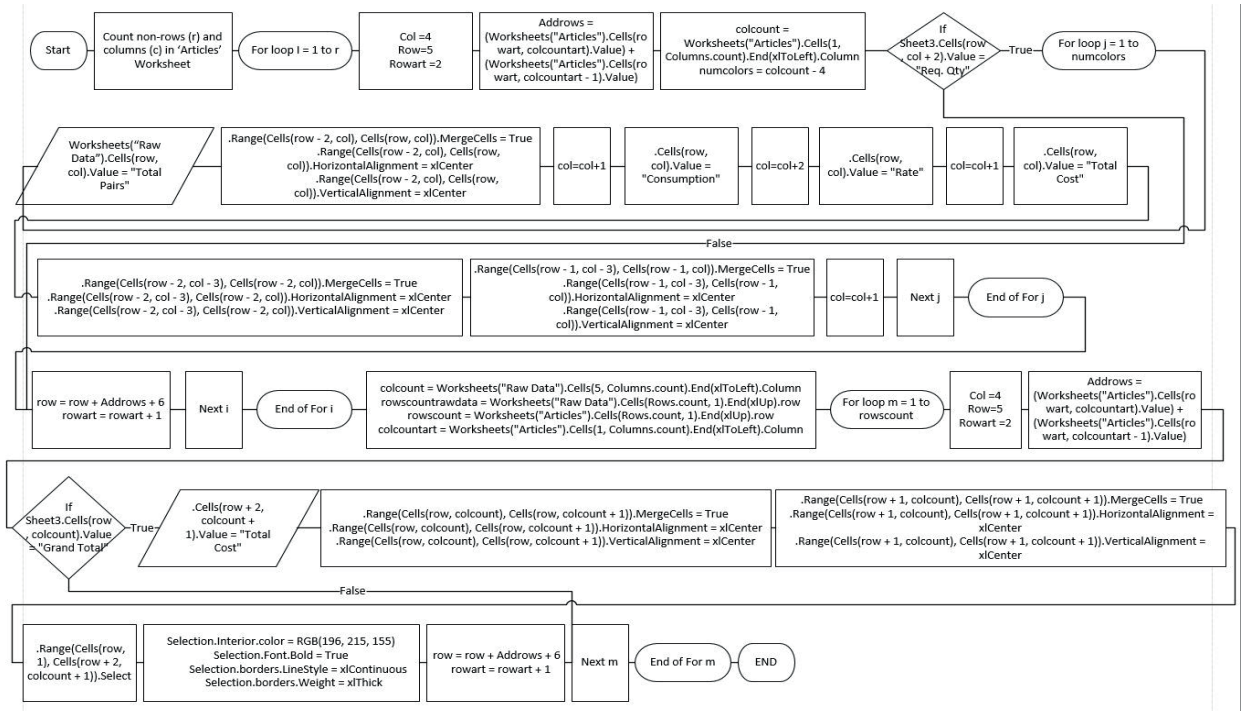

Figure 19: Flowchart representing the code for putting the values in the 'Raw Data worksheet'.

Item	Article	Warehouse		Brown					D/Blue					Expresso					Namibia		
Color	Article	Warehouse	Total Pairs	Brown				Total Pairs	D/Blue				Total Pairs	Expresso				Total Pairs	Namibia		
Pairs																					
Item Description				Consumptio	Req. Qty	Rate	Total Cost		Consumpt	Req. Qty	Rate	Total Cost		Consumpt	Req. Qty	Rate	Total Cost		Consumpt	Req. Qty	Rate
Lthr Store																					
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store																		4.19	
BuffPet1.4-1.6 mmNavy	2083 DBY	Lthr Store																		1.64	
CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store																		0.16	
CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store																		6.45	
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store																		1.05	
Shoe Mat																					
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat																		3	
ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat																		0.02	
ChemicalEthylestateDefaultDefault	2083 DBY	Shoe Mat																		0.01	
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat																		0.12	
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat																		0.08	
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat																		0.02	
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat																		0.07	
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat																		0.04	
ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat																		0.27	
ElasticImpElastic Imported80 mmD/Brown	2083 DBY	Shoe Mat																		0.33	
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat																		24	
FoamFoam10mmGrey	2083 DBY	Shoe Mat																		0.04	
FoamFoam4mmWhite	2083 DBY	Shoe Mat																		0	
PackngGen.Nylon String5"White	2083 DBY	Shoe Mat																		3	
PackngTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat																		0.07	
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat																		3	
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat																		0.15	
ShetWintexInsole Wintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat																		0.13	
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat																		3	
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat																		0.06	
SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat																		6	
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat																		3	
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat																		3	
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat																		0.33	
Thread H/SHand Stitch Waxy Thread Local1 mmOff White	2083 DBY	Shoe Mat																		9	
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat																		3	

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Figure 20: The result produced by the code is represented in Figure 19.

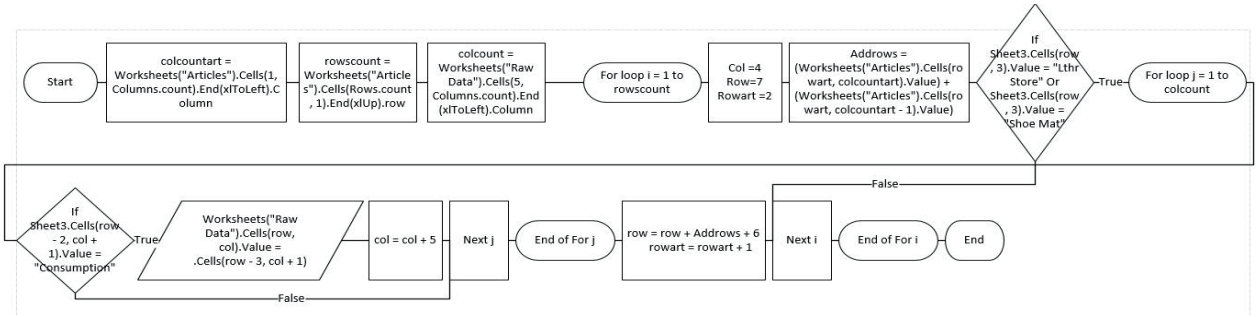
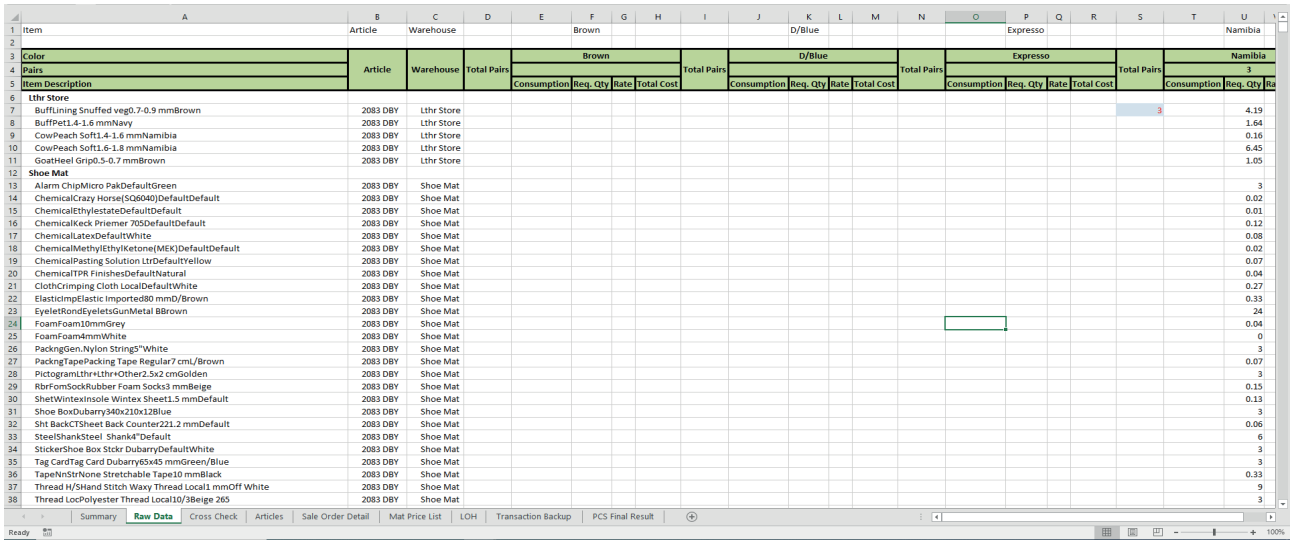


Figure 21: Flowchart representing the code for pasting pairs in 'Raw Data' worksheet from the 'Articles' worksheet.



Item	Article	Warehouse			Brown					D/Blue					Expresso					Namibia
Color				Brown					D/Blue					Expresso					Namibia	
Pairs	Article	Warehouse	Total Pairs					Total Pairs					Total Pairs					Total Pairs	3	
Item Description				Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty
Lthr Store																				
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store																3		4.19
BuffPet1.4-1.6 mmNavy	2083 DBY	Lthr Store																		1.64
CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store																		0.16
CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store																		6.45
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store																		1.05
Shoe Mat																				
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat																		3
ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat																		0.02
ChemicalEthylestateDefaultDefault	2083 DBY	Shoe Mat																		0.01
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat																		0.12
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat																		0.08
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat																		0.02
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat																		0.07
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat																		0.04
ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat																		0.27
ElasticImpElastic Imported80 mmD/Brown	2083 DBY	Shoe Mat																		0.33
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat																		24
FoamFoam10mmGrey	2083 DBY	Shoe Mat																		0.04
FoamFoam4mmWhite	2083 DBY	Shoe Mat																		0
PackngGen.Nylon String5"White	2083 DBY	Shoe Mat																		3
PackngTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat																		0.07
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat																		3
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat																		0.15
ShetWintexInsole Wintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat																		0.13
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat																		3
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat																		0.06
SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat																		6
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat																		3
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat																		3
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat																		0.33
Thread H/SHand Stitch Waxy Thread Local1 nmOff White	2083 DBY	Shoe Mat																		9
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat																		3

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transaction Backup | PCS Final Result

Figure 22: The result produced by the code is represented in Figure 21.

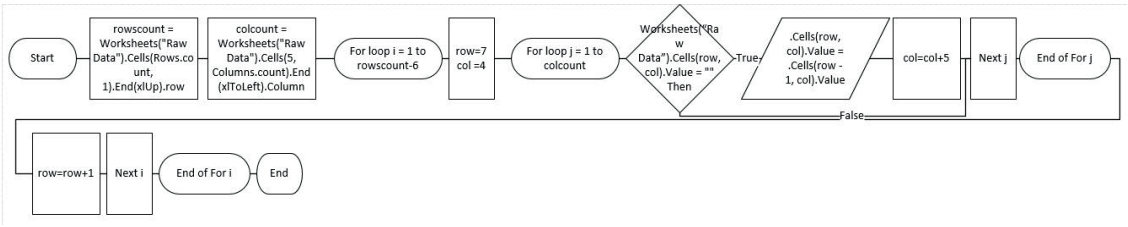
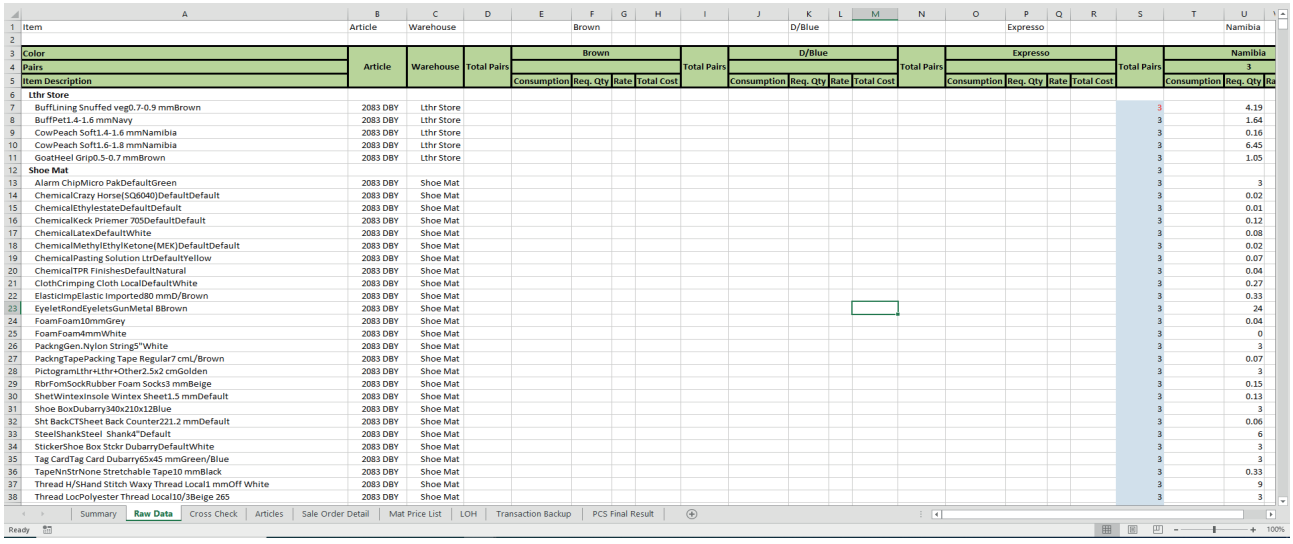


Figure 23: Flowchart representing the code for dragging the pasted pairs in the 'Raw Data' worksheet.



Item	Article	Warehouse			Brown					D/Blue					Expresso					Namibia
Color				Brown					D/Blue					Expresso					Namibia	
Pairs	Article	Warehouse	Total Pairs					Total Pairs					Total Pairs					Total Pairs	3	
Item Description				Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty
Lthr Store																				
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store																3		4.19
BuffPet1.4-1.6 mmNavy	2083 DBY	Lthr Store																3		1.64
CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store																3		0.16
CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store																3		6.45
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store																3		1.05
Shoe Mat																		3		
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat																3		3
ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat																3		0.02
ChemicalEthylestateDefaultDefault	2083 DBY	Shoe Mat																3		0.01
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat																3		0.12
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat																3		0.08
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat																3		0.02
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat																3		0.07
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat																3		0.04
ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat																3		0.27
ElasticImpElastic Imported80 mmD/Brown	2083 DBY	Shoe Mat																3		0.33
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat																3		24
FoamFoam10mmGrey	2083 DBY	Shoe Mat																3		0.04
FoamFoam4mmWhite	2083 DBY	Shoe Mat																3		0
PackngGen.Nylon String5"White	2083 DBY	Shoe Mat																3		3
PackngTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat																3		0.07
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat																3		3
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat																3		0.15
ShetWintexInsole Wintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat																3		0.13
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat																3		3
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat																3		0.06
SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat																3		6
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat																3		3
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat																3		3
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat																3		0.33
Thread H/SHand Stitch Waxy Thread Local1 nmOff White	2083 DBY	Shoe Mat																3		9
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat																3		3

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transaction Backup | PCS Final Result

Figure 24: The result produced by the code is represented in Figure 23.

8.13. Insert Article Numbers and Headings for Totals

In the code represented by the flowchart given in Figure 25; the values from the first row are erased and another row inserted. Furthermore, the values of the article are pasted with the prefix i.e. 'Article #'. The font of pasted entries is made bold. In the next row of the last item of every article, the header of 'Total Cost' is put and its font is made bold after putting the interior color (RGB (216, 228, 188)). In last the row below the total is inserted as can be seen in Figure 26.

Above discussed amendments are made in every article included in the order costing report shown in Figure 26.

8.14. Putting Continuous Thin Borders

VBA code represented by the flowchart given in Figure 27, was used for putting continuous thin borders on all the cells containing items description and the associated values.

At the same time,the background color of two rows above every article detail (as rows 1, 2 47, and 48 in Figure 28) was formatted white as can be seen in Figure 28.

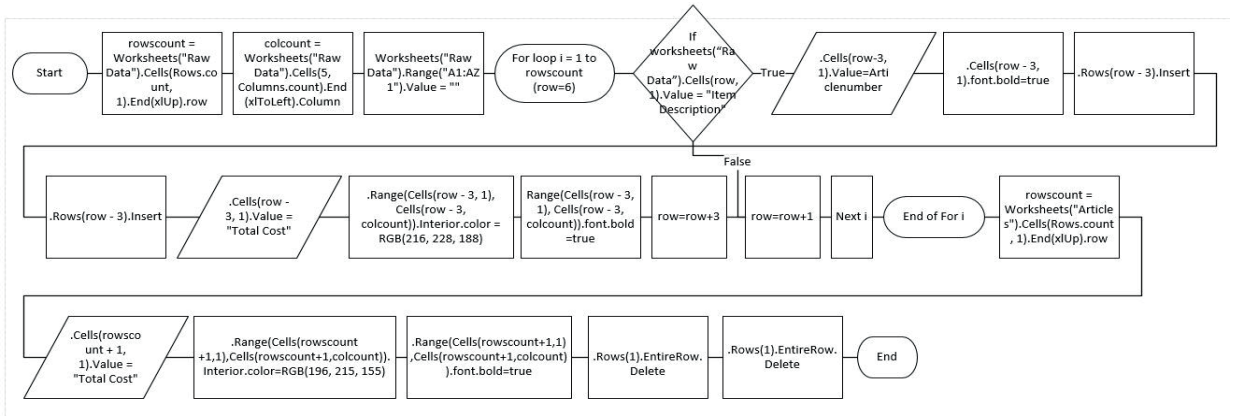
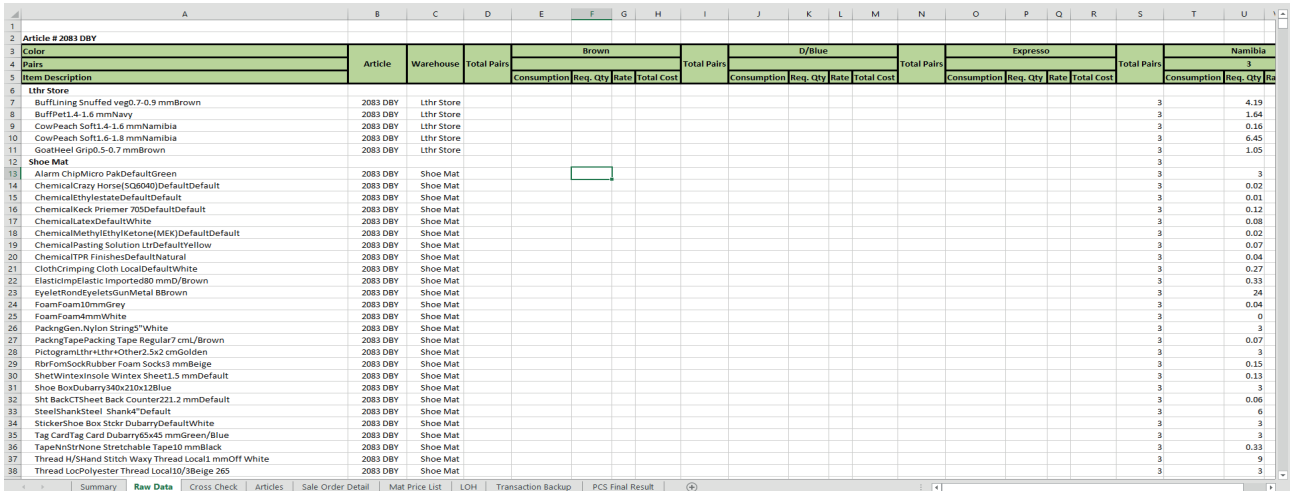


Figure 25: Flowchart representing the code for putting the article details in 'Raw Data' worksheet.



Article # 2083 DBY																					
Color				Brown					D/Blue					Expresso					Namibia		
Pairs	Article	Warehouse	Total Pairs					Total Pairs					Total Pairs					Total Pairs	3		
Item Description				Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Ra
Lthr Store																					
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store																3		4.19	
BuffPet1.4-1.6 mmNavy	2083 DBY	Lthr Store																3		1.64	
CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store																3		0.16	
CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store																3		6.45	
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store																3		1.05	
Shoe Mat																		3			
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat																3		3	
ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat																3		0.02	
ChemicalEthylestateDefaultDefault	2083 DBY	Shoe Mat																3		0.01	
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat																3		0.12	
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat																3		0.08	
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat																3		0.02	
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat																3		0.07	
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat																3		0.04	
ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat																3		0.27	
ElasticImpElastic Imported80 mmD/Brown	2083 DBY	Shoe Mat																3		0.33	
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat																3		24	
FoamFoam10mmGrey	2083 DBY	Shoe Mat																3		0.04	
FoamFoam4mmWhite	2083 DBY	Shoe Mat																3		0	
PackngGen.Nylon String5"White	2083 DBY	Shoe Mat																3		3	
PackngTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat																3		0.07	
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat																3		3	
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat																3		0.15	
ShetWintexInsole Wintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat																3		0.13	
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat																3		3	
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat																3		0.06	
SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat																3		6	
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat																3		3	
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat																3		3	
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat																3		0.33	
Thread H/SHand Stitch Waxy Thread Local1 mmOff White	2083 DBY	Shoe Mat																3		9	
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat																3		3	

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transaction Backup | PCS Final Result

Figure 26: The result produced by the code is represented in Figure 25.

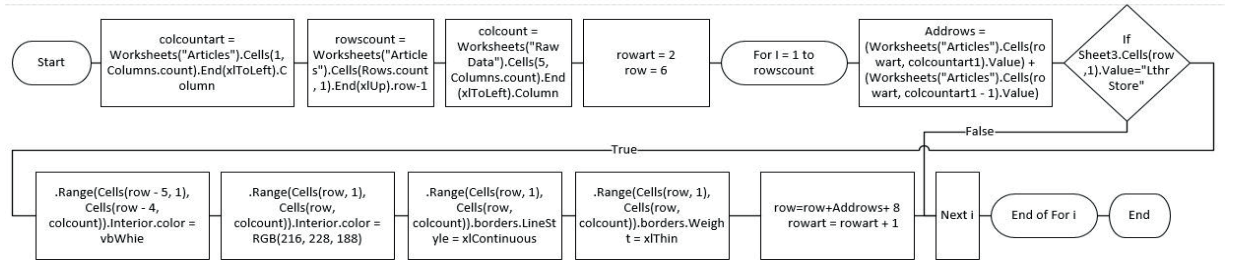
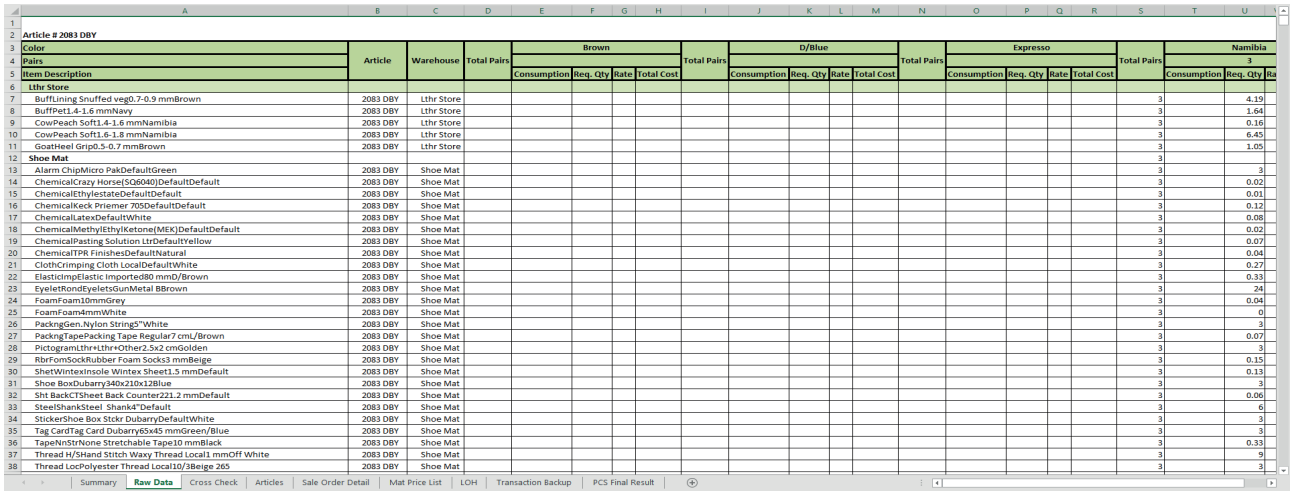


Figure 27: Flowchart representing the code for putting a thin border on the filled cells of the 'Raw Data' worksheet.



Article # 2083 DBY																					
Color				Brown					D/Blue					Expresso					Namibia		
Pairs	Article	Warehouse	Total Pairs					Total Pairs					Total Pairs					Total Pairs	3		
Item Description				Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Rate	Total Cost		Consumption	Req. Qty	Ra
Lthr Store																					
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store																3		4.19	
BuffPet1.4-1.6 mmNavy	2083 DBY	Lthr Store																3		1.64	
CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store																3		0.16	
CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store																3		6.45	
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store																3		1.05	
Shoe Mat																		3			
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat																3		3	
ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat																3		0.02	
ChemicalEthylestateDefaultDefault	2083 DBY	Shoe Mat																3		0.01	
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat																3		0.12	
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat																3		0.08	
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat																3		0.02	
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat																3		0.07	
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat																3		0.04	
ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat																3		0.27	
ElasticImpElastic Imported80 mmD/Brown	2083 DBY	Shoe Mat																3		0.33	
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat																3		24	
FoamFoam10mmGrey	2083 DBY	Shoe Mat																3		0.04	
FoamFoam4mmWhite	2083 DBY	Shoe Mat																3		0	
PackngGen.Nylon String5"White	2083 DBY	Shoe Mat																3		3	
PackngTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat																3		0.07	
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat																3		3	
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat																3		0.15	
ShetWintexInsole Wintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat																3		0.13	
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat																3		3	
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat																3		0.06	
SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat																3		6	
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat																3		3	
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat																3		3	
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat																3		0.33	
Thread H/SHand Stitch Waxy Thread Local1 mmOff White	2083 DBY	Shoe Mat																3		9	
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat																3		3	

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Figure 28: The result produced by the code is represented in Figure 27.

8.15. Calculation of Various Parameters of Every Color of Each Article

With the help of the VBA code represented by the flowchart given in Figure 29, the material cost is picked from the 'Mat Price List' worksheet by applying vlookup formulae; furthermore, consumption, required quantity, and total cost of the items to be used in the specific color of an article are calculated (see Figure 29).

In the same way, the above-mentioned parameters are calculated for each color of every article by the use of For loop which is repeated as many times as the number of rows present in the 'Raw Data' worksheet as mentioned in the flowchart (see Figure 29)

After the calculation for all the colors of every article, the total required quantity and total cost of each item to be used in the article in its various colors are calculated as can be seen in the column AC and AD (see Figure 30). The total required quantity and the total cost is calculated for each of the article present in the order costing report.

8.16. Delete Pair Columns

When all the parameters are calculated (i.e. required quantity, consumption, and total cost of items), there is no need for columns I, N, S, X (see Figure 30).

With the help of the VBA code presented in the flowchart given in Figure 31, the columns headed with 'Total Pairs' were deleted as can be seen in Figure 32.

8.17. Put The Totals

A look at Figure 33 indicates that the totals are missing in the report; the VBA code presented by the flowchart given

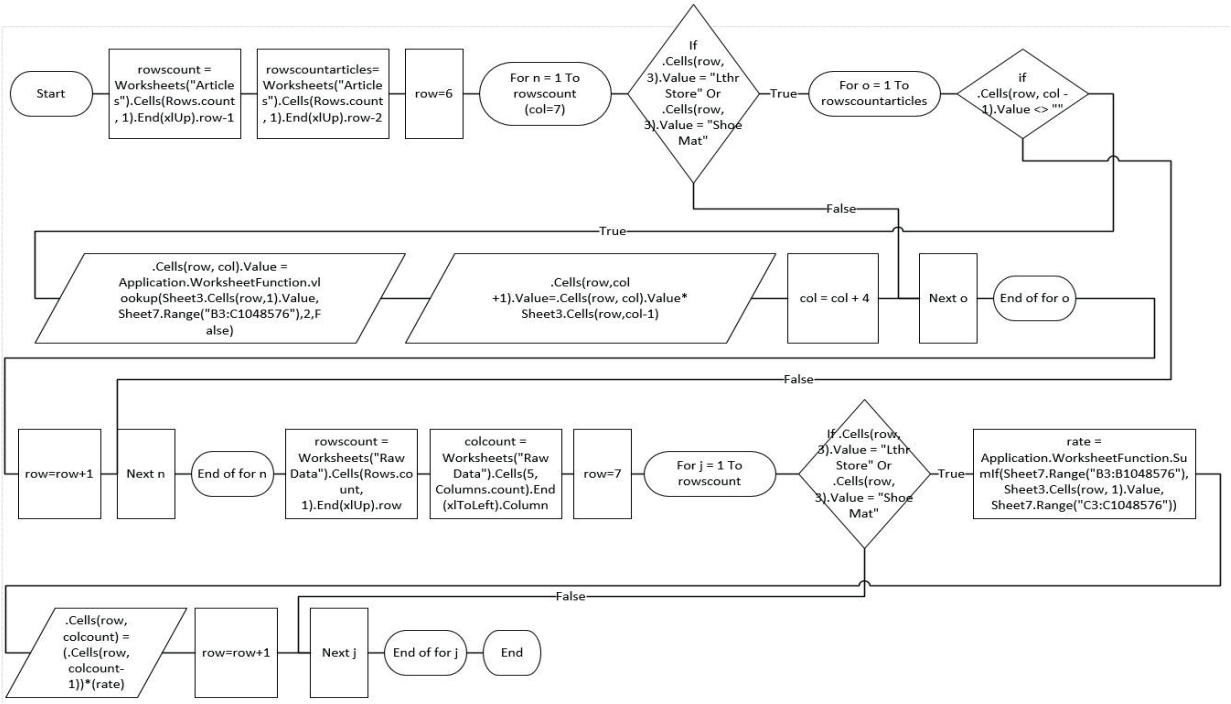


Figure 29: Flowchart representing the code for inserting the pairs and the calculation of items` consumption and total cost of articles in 'Raw Data' worksheet.

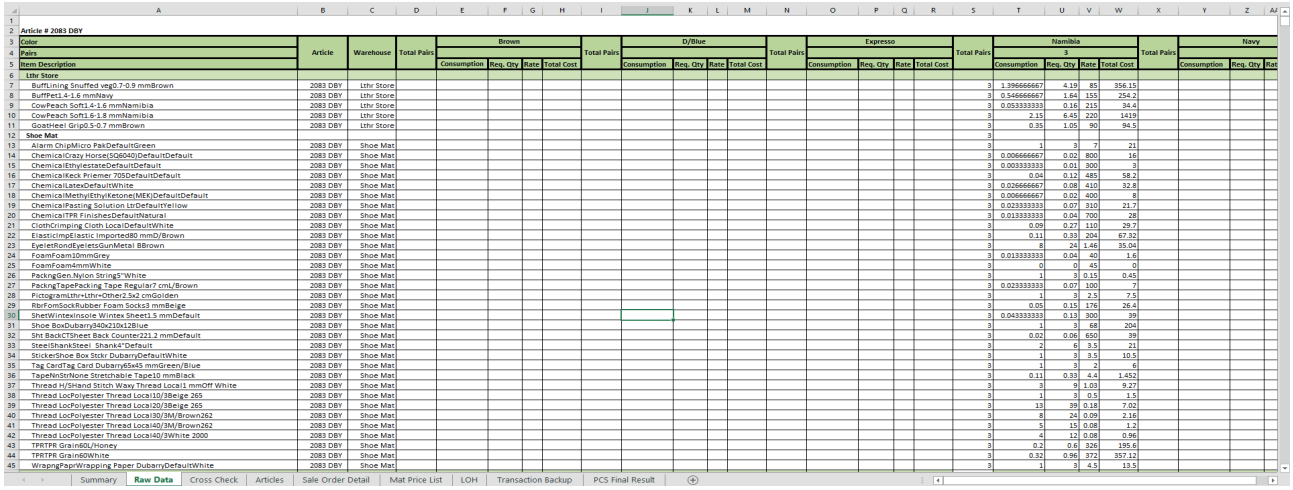


Figure 30: The result produced by the code is represented in Figure 29.

in Figure 33 was used for putting the totals in the order costing report.

One total of leather material cost for each of the articles was calculated as can be seen in Figure 34. Moreover, the totals for shoe material cost for each color of every article were calculated (see Figure 34).

The same activities were repeated for every article with the help of Loop (see Figure 33).

8.18. Remove Zero Values from Totals

Since unnecessary zeros are looking awkward in the report (see Figure 34); thus it was necessary to remove these only zeros from the row presenting totals. VBA code presented by the flowchart given in Figure 35 was used for erasing zeros from the report.

It can be seen in Figure 36 that all the single zeros are removed from the report; this process is repeated on all the articles present in the order costing report by the use of for loop (see Figure 35).

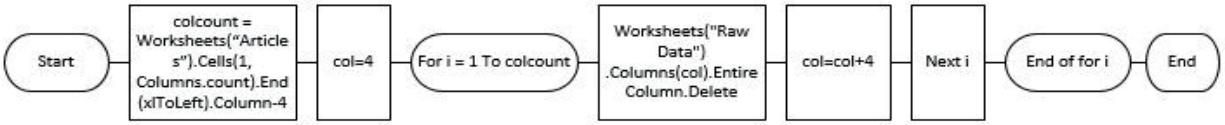
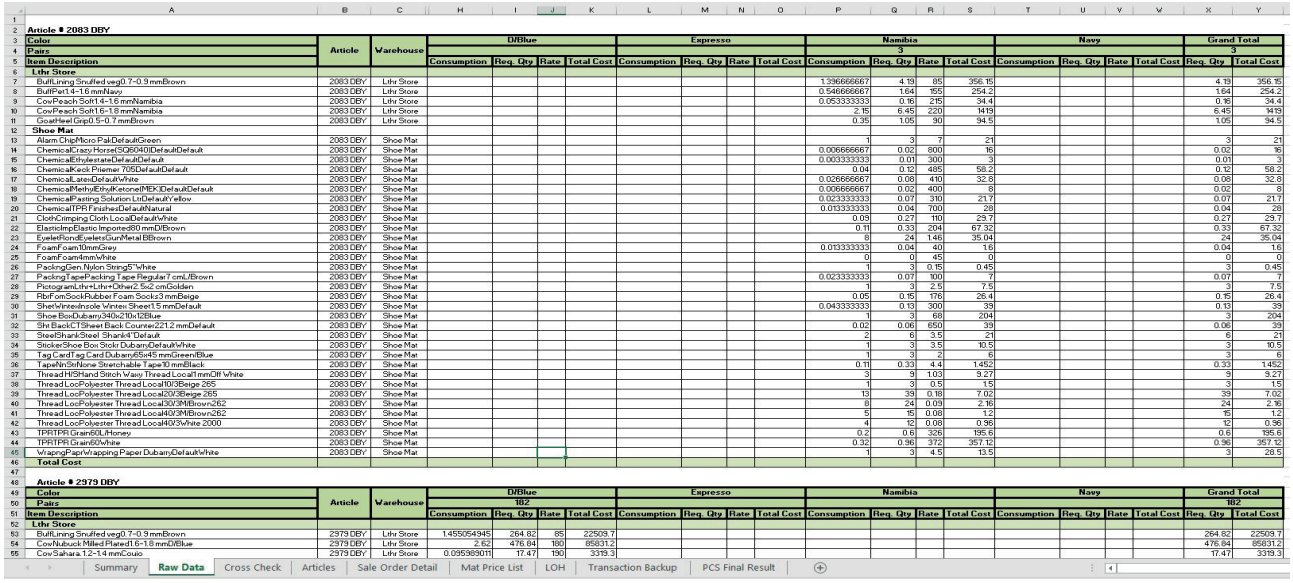


Figure 31: Flowchart representing the code for deleting the columns containing pairs of articles in the 'Raw Data worksheet'.



Article # 2083 DBY																							
Color	Article	Warehouse	D/Blue				Expresso				Namibia				Navy				Grand Total	
Pairs											3								3	
Item Description			Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Req. Qty	Total Cost
Lthr Store																				
ButtLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store									1.396666667	4.19	85	356.15					4.19	356.15
ButtPad1.4-1.6 mmNavy	2083 DBY	Lthr Store									0.546666667	1.64	155	254.2					1.64	254.2
CowPeach Soft1.4-1.6 mmNamibia	2083 DBY	Lthr Store									0.053333333	0.16	215	34.4					0.16	34.4
CowPeach Soft1.6-1.8 mmNamibia	2083 DBY	Lthr Store									2.15	6.45	220	1419					6.45	1419
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store									0.35	1.05	90	94.5					1.05	94.5
Shoe Mat																				
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat									1	3	7	21					3	21
ChemicalCrazy Horse(SQ6040)DefaultDefault	2083 DBY	Shoe Mat									0.006666667	0.02	800	16					0.02	16
ChemicalEthylvetateDefaultDefault	2083 DBY	Shoe Mat									0.003333333	0.01	300	3					0.01	3
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat									0.04	0.12	485	58.2					0.12	58.2
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat									0.026666667	0.08	410	32.8					0.08	32.8
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat									0.006666667	0.02	400	8					0.02	8
ChemicalPainting Solution LinDefaultYellow	2083 DBY	Shoe Mat									0.023333333	0.07	310	21.7					0.07	21.7
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat									0.013333333	0.04	700	28					0.04	28
ClothCrimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat									0.09	0.27	110	29.7					0.27	29.7
ElasticImpElastic Imported80 mmDBrown	2083 DBY	Shoe Mat									0.11	0.33	204	67.32					0.33	67.32
EyeletRondEyelets(GunMetal BBrown	2083 DBY	Shoe Mat									8	24	1.46	35.04					24	35.04
FoamFoam10mmGrey	2083 DBY	Shoe Mat									0.013333333	0.04	40	1.6					0.04	1.6
FoamFoam4mmWhite	2083 DBY	Shoe Mat									0	0	45	0					0	0
PackingGen.Nylon String5"White	2083 DBY	Shoe Mat									1	3	0.15	0.45					3	0.45
PackingTapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat									0.023333333	0.07	100	7					0.07	7
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat									1	3	2.5	7.5					3	7.5
RbtFootSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat									0.05	0.15	176	26.4					0.15	26.4
SheetVintexInsole Vintex Sheet1.5 mmDefault	2083 DBY	Shoe Mat									0.043333333	0.13	300	39					0.13	39
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat									1	3	68	204					3	204
Str BackCTSheet Back Courier221.2 mmDefault	2083 DBY	Shoe Mat									0.02	0.06	650	39					0.06	39
SteelShankSteel Shank4"Default	2083 DBY	Shoe Mat									2	6	3.5	21					6	21
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat									1	3	3.5	10.5					3	10.5
Tag CardTag Card Dubarry65x45 mmGreenBlue	2083 DBY	Shoe Mat									1	3	2	6					3	6
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat									0.11	0.33	4.4	1.452					0.33	1.452
ThreadHSHand Stitch Wavy Thread Local1mmOff White	2083 DBY	Shoe Mat									3	9	1.03	9.27					9	9.27
ThreadLocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat									1	3	0.5	1.5					3	1.5
ThreadLocPolyester Thread Local20/3Beige 265	2083 DBY	Shoe Mat									13	39	0.18	7.02					39	7.02
ThreadLocPolyester Thread Local30/3MiBrown262	2083 DBY	Shoe Mat									8	24	0.09	2.16					24	2.16
ThreadLocPolyester Thread Local40/3MiBrown262	2083 DBY	Shoe Mat									5	15	0.08	1.2					15	1.2
ThreadLocPolyester Thread Local40/3White 2000	2083 DBY	Shoe Mat									4	12	0.08	0.96					12	0.96
TPRTPR Grain60L/Honey	2083 DBY	Shoe Mat									0.2	0.6	326	195.6					0.6	195.6
TPRTPR Grain60White	2083 DBY	Shoe Mat									0.32	0.96	372	357.12					0.96	357.12
WrapngPapr WrapPapr DubarryDefaultWhite	2083 DBY	Shoe Mat									1	3	4.5	13.5					3	28.5
Total Cost																				

Article # 2979 DBY																							
Color	Article	Warehouse	D/Blue				Expresso				Namibia				Navy				Grand Total	
Pairs			182																182	
Item Description			Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Req. Qty	Total Cost
Lthr Store																				
ButtLining Snuffed veg0.7-0.9 mmBrown	2979 DBY	Lthr Store	1.455054945	264.82	85	22509.7													264.82	22509.7
CowNubuck Milled Plated1.6-1.8 mmDBlue	2979 DBY	Lthr Store	2.62	476.84	180	85831.2													476.84	85831.2
CowSahara 1.2-1.4 mmCouio	2979 DBY	Lthr Store	0.095989011	17.47	190	3319.3													17.47	3319.3

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transaction Backup | PCS Final Result

Figure 32: The result produced by the code is represented in Figure 31.

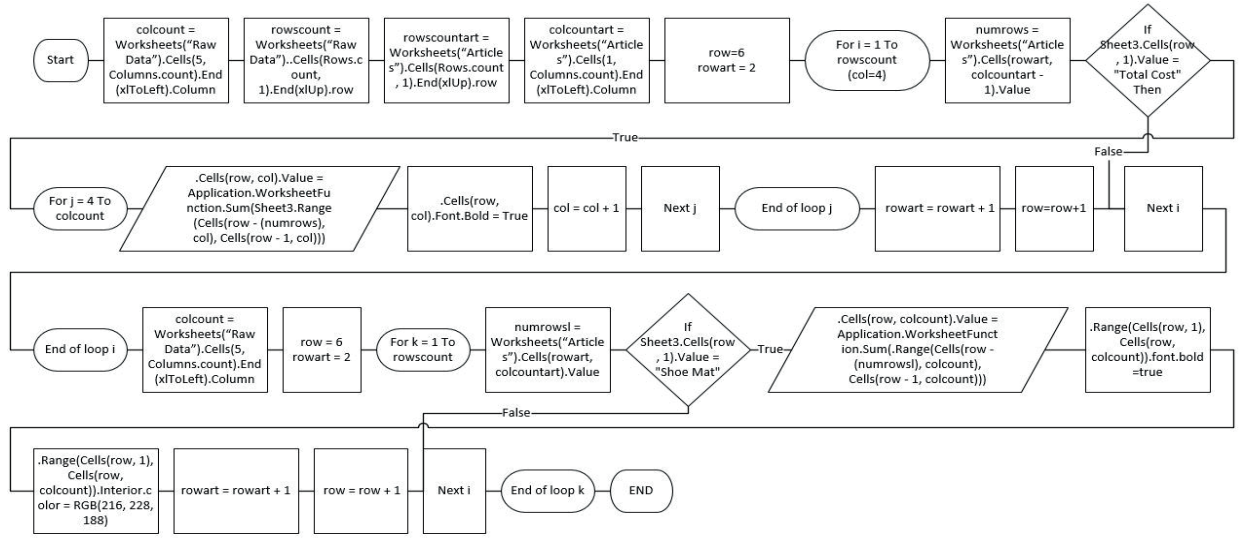
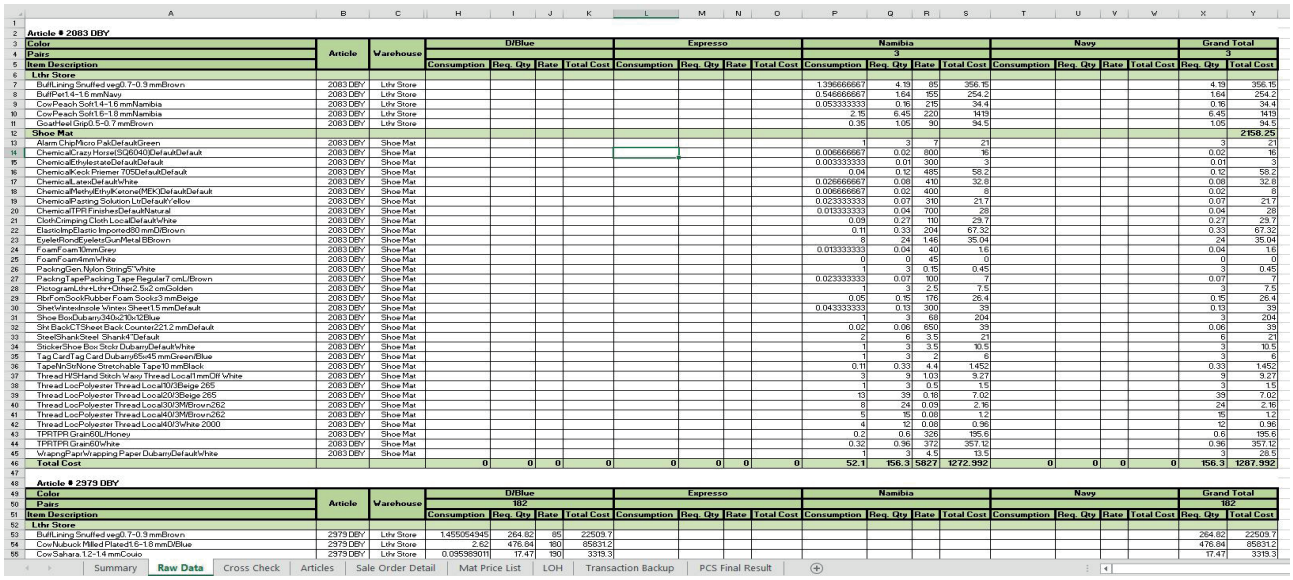


Figure 33: Flowchart representing the code for putting the totals in the 'Raw Data' worksheet.



Article # 2083 DBY																									
Color	Article	Warehouse	D/Blue				Espresso				Namibia				Navy				Grand Total	
Pairs											3									
Item Description			Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Req. Qty	Total Cost
Lthr Store																				
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store									1.396666667	4.19	85	356.15					4.19	356.15
BuffPart1.4-1.6 mmNavy	2083 DBY	Lthr Store									0.546666667	1.64	155	254.2					1.64	254.2
CowPeach Soft1.4-1.6 mmNambia	2083 DBY	Lthr Store									0.053333333	0.16	215	34.4					0.16	34.4
CowPeach Soft1.6-1.8 mmNambia	2083 DBY	Lthr Store									2.15	6.45	220	1419					6.45	1419
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store									0.35	1.05	90	94.5					1.05	94.5
Shoe Mat																				2158.25
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat									1	3	7	21					3	21
ChemicalCrazy Horse(SG6040)DefaultDefault	2083 DBY	Shoe Mat									0.006666667	0.02	800	16					0.02	16
ChemicalEthylesrateDefaultDefault	2083 DBY	Shoe Mat									0.003333333	0.01	300	3					0.01	3
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat									0.04	0.12	485	58.2					0.12	58.2
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat									0.026666667	0.08	410	32.8					0.08	32.8
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat									0.006666667	0.02	400	8					0.02	8
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat									0.023333333	0.07	310	21.7					0.07	21.7
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat									0.013333333	0.04	700	28					0.04	28
ClothClimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat									0.09	0.27	110	29.7					0.27	29.7
ElasticImpElastic Imported80 mmDBrown	2083 DBY	Shoe Mat									0.11	0.33	204	67.32					0.33	67.32
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat									8	24	1.46	35.04					24	35.04
FoamFoam10mmGrey	2083 DBY	Shoe Mat									0.013333333	0.04	40	1.6					0.04	1.6
FoamFoam4mmWhite	2083 DBY	Shoe Mat									0	0	45	0					0	0
PackingGen.Nylon StringS'White	2083 DBY	Shoe Mat									1	3	0.15	0.45					3	0.45
Packing1 tapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat									0.023333333	0.07	100	7					0.07	7
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat									1	3	2.5	7.5					3	7.5
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat									0.05	0.15	176	26.4					0.15	26.4
ShetWinterInsole Winter Sheet1.5 mmDefault	2083 DBY	Shoe Mat									0.043333333	0.13	300	39					0.13	39
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat									1	3	68	204					3	204
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat									0.02	0.06	650	39					0.06	39
SteelShankSteel Shank4 'Default	2083 DBY	Shoe Mat									2	6	3.5	21					6	21
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat									1	3	3.5	10.5					3	10.5
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat									1	3	2	6					3	6
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat									0.11	0.33	4.4	1.452					0.33	1.452
Thread HSHand Stitch Waxy Thread Local1 mmOff White	2083 DBY	Shoe Mat									3	3	1.03	3.27					3	3.27
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat									1	3	0.5	1.5					3	1.5
Thread LocPolyester Thread Local20/3Beige 265	2083 DBY	Shoe Mat									13	39	0.18	7.02					39	7.02
Thread LocPolyester Thread Local30/3MBrown262	2083 DBY	Shoe Mat									8	24	0.09	2.16					24	2.16
Thread LocPolyester Thread Local40/3MBrown262	2083 DBY	Shoe Mat									5	15	0.08	1.2					15	1.2
Thread LocPolyester Thread Local40/3White 2000	2083 DBY	Shoe Mat									4	12	0.08	0.96					12	0.96
TPRTPR Grain60L/Honey	2083 DBY	Shoe Mat									0.2	0.6	326	195.6					0.6	195.6
TPRTPR Grain60/White	2083 DBY	Shoe Mat									0.32	0.96	372	357.12					0.96	357.12
WrapngPaprWrapping Paper DubarryDefaultWhite	2083 DBY	Shoe Mat									1	3	4.5	13.5					3	28.5
Total Cost			0	0	0	0	0	0	0	0	52.1	156.3	5827	1272.992	0	0	0	0	156.3	1287.992

Article # 2979 DBY																				
Color	Article	Warehouse	D/Blue				Espresso				Namibia				Navy				Grand Total	
Pairs			182																182	
Item Description			Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Req. Qty	Total Cost
Lthr Store																				
BuffLining Snuffed veg0.7-0.9 mmBrown	2979 DBY	Lthr Store	1.455054945	264.82	85	22509.7													264.82	22509.7
CowNubuck Milled Plated1.6-1.8 mmD/Blue	2979 DBY	Lthr Store	2.62	476.84	180	85831.2													476.84	85831.2
CowSahara 1.2-1.4 mmCouio	2979 DBY	Lthr Store	0.095389011	17.47	190	3319.3													17.47	3319.3

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transaction Backup | PCS Final Result

Figure 34: The result produced by the code is represented in Figure 33.

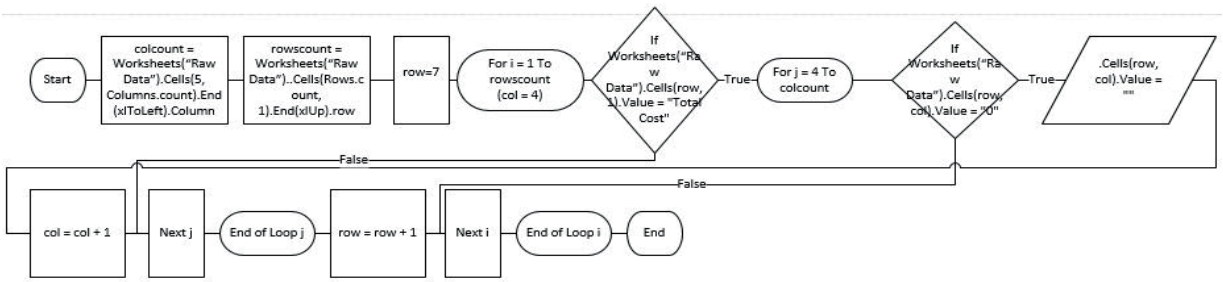
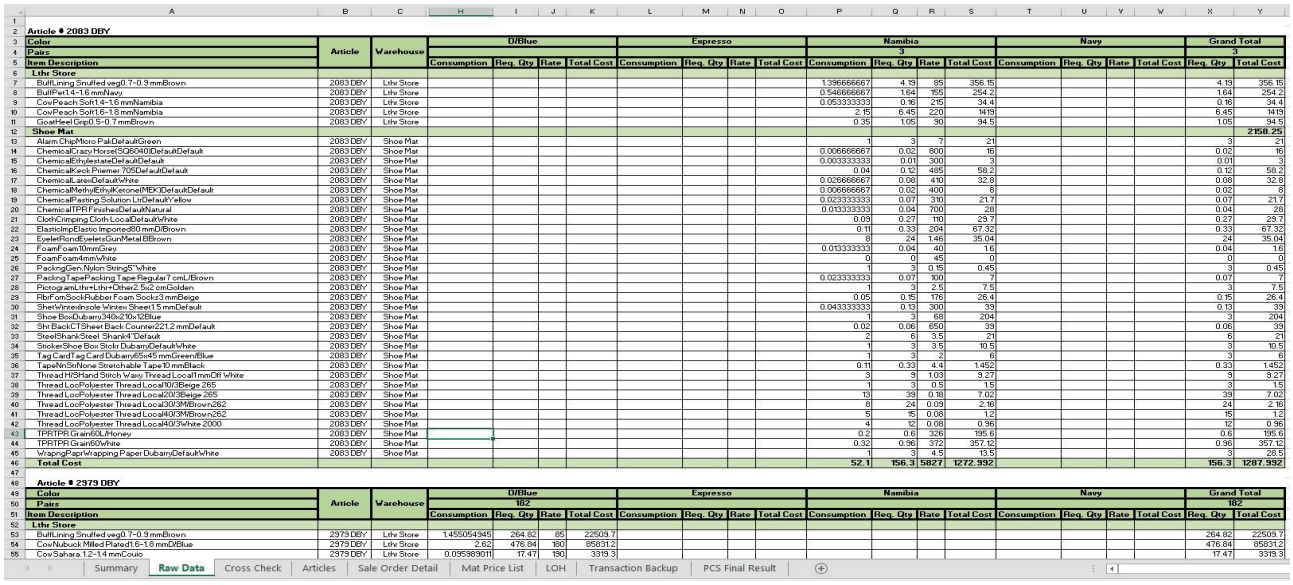


Figure 35: flowchart representing the code for erasing zeros from the totals in the 'Raw Data' worksheet.



Article # 2083 DBY																									
Color	Article	Warehouse	D/Blue				Espresso				Namibia				Navy				Grand Total	
Pairs											3									
Item Description			Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Req. Qty	Total Cost
Lthr Store																				
BuffLining Snuffed veg0.7-0.9 mmBrown	2083 DBY	Lthr Store									1.396666667	4.19	85	356.15					4.19	356.15
BuffPart1.4-1.6 mmNavy	2083 DBY	Lthr Store									0.546666667	1.64	155	254.2					1.64	254.2
CowPeach Soft1.4-1.6 mmNambia	2083 DBY	Lthr Store									0.053333333	0.16	215	34.4					0.16	34.4
CowPeach Soft1.6-1.8 mmNambia	2083 DBY	Lthr Store									2.15	6.45	220	1419					6.45	1419
GoatHeel Grip0.5-0.7 mmBrown	2083 DBY	Lthr Store									0.35	1.05	90	94.5					1.05	94.5
Shoe Mat																				2158.25
Alarm ChipMicro PakDefaultGreen	2083 DBY	Shoe Mat									1	3	7	21					3	21
ChemicalCrazy Horse(SG6040)DefaultDefault	2083 DBY	Shoe Mat									0.006666667	0.02	800	16					0.02	16
ChemicalEthylesrateDefaultDefault	2083 DBY	Shoe Mat									0.003333333	0.01	300	3					0.01	3
ChemicalKeck Priemer 705DefaultDefault	2083 DBY	Shoe Mat									0.04	0.12	485	58.2					0.12	58.2
ChemicalLatexDefaultWhite	2083 DBY	Shoe Mat									0.026666667	0.08	410	32.8					0.08	32.8
ChemicalMethylEthylKetone(MEK)DefaultDefault	2083 DBY	Shoe Mat									0.006666667	0.02	400	8					0.02	8
ChemicalPasting Solution LtrDefaultYellow	2083 DBY	Shoe Mat									0.023333333	0.07	310	21.7					0.07	21.7
ChemicalTPR FinishesDefaultNatural	2083 DBY	Shoe Mat									0.013333333	0.04	700	28					0.04	28
ClothClimping Cloth LocalDefaultWhite	2083 DBY	Shoe Mat									0.09	0.27	110	29.7					0.27	29.7
ElasticImpElastic Imported80 mmDBrown	2083 DBY	Shoe Mat									0.11	0.33	204	67.32					0.33	67.32
EyeletRondEyeletsGunMetal BBrown	2083 DBY	Shoe Mat									8	24	1.46	35.04					24	35.04
FoamFoam10mmGrey	2083 DBY	Shoe Mat									0.013333333	0.04	40	1.6					0.04	1.6
FoamFoam4mmWhite	2083 DBY	Shoe Mat									0	0	45	0					0	0
PackingGen.Nylon StringS'White	2083 DBY	Shoe Mat									1	3	0.15	0.45					3	0.45
Packing1 tapePacking Tape Regular7 cmL/Brown	2083 DBY	Shoe Mat									0.023333333	0.07	100	7					0.07	7
PictogramLthr+Lthr+Other2.5x2 cmGolden	2083 DBY	Shoe Mat									1	3	2.5	7.5					3	7.5
RbrFomSockRubber Foam Socks3 mmBeige	2083 DBY	Shoe Mat									0.05	0.15	176	26.4					0.15	26.4
ShetWinterInsole Winter Sheet1.5 mmDefault	2083 DBY	Shoe Mat									0.043333333	0.13	300	39					0.13	39
Shoe BoxDubarry340x210x12Blue	2083 DBY	Shoe Mat									1	3	68	204					3	204
Sht BackCTSheet Back Counter221.2 mmDefault	2083 DBY	Shoe Mat									0.02	0.06	650	39					0.06	39
SteelShankSteel Shank4 'Default	2083 DBY	Shoe Mat									2	6	3.5	21					6	21
StickerShoe Box Stckr DubarryDefaultWhite	2083 DBY	Shoe Mat									1	3	3.5	10.5					3	10.5
Tag CardTag Card Dubarry65x45 mmGreen/Blue	2083 DBY	Shoe Mat									1	3	2	6					3	6
TapeNnStrNone Stretchable Tape10 mmBlack	2083 DBY	Shoe Mat									0.11	0.33	4.4	1.452					0.33	1.452
Thread HSHand Stitch Waxy Thread Local1 mmOff White	2083 DBY	Shoe Mat									3	3	1.03	3.27					3	3.27
Thread LocPolyester Thread Local10/3Beige 265	2083 DBY	Shoe Mat									1	3	0.5	1.5					3	1.5
Thread LocPolyester Thread Local20/3Beige 265	2083 DBY	Shoe Mat									13	39	0.18	7.02					39	7.02
Thread LocPolyester Thread Local30/3MBrown262	2083 DBY	Shoe Mat									8	24	0.09	2.16					24	2.16
Thread LocPolyester Thread Local40/3MBrown262	2083 DBY	Shoe Mat									5	15	0.08	1.2					15	1.2
Thread LocPolyester Thread Local40/3White 2000	2083 DBY	Shoe Mat									4	12	0.08	0.96					12	0.96
TPRTPR Grain60L/Honey	2083 DBY	Shoe Mat									0.2	0.6	326	195.6					0.6	195.6
TPRTPR Grain60/White	2083 DBY	Shoe Mat									0.32	0.96	372	357.12					0.96	357.12
WrapngPaprWrapping Paper DubarryDefaultWhite	2083 DBY	Shoe Mat									1	3	4.5	13.5					3	28.5
Total Cost											52.1	156.3	5827	1272.992					156.3	1287.992

Article # 2979 DBY																				
Color	Article	Warehouse	D/Blue				Espresso				Namibia				Navy				Grand Total	
Pairs			182																182	
Item Description			Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Consumption	Req. Qty	Rate	Total Cost	Req. Qty	Total Cost
Lthr Store																				
BuffLining Snuffed veg0.7-0.9 mmBrown	2979 DBY	Lthr Store	1.455054945	264.82	85	22509.7													264.82	22509.7
CowNubuck Milled Plated1.6-1.8 mmD/Blue	2979 DBY	Lthr Store	2.62	476.84	180	85831.2													476.84	85831.2
CowSahara 1.2-1.4 mmCouio	2979 DBY	Lthr Store	0.095389011	17.47	190	3319.3													17.47	3319.3

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transaction Backup | PCS Final Result

Figure 36: The result produced by the code is represented in Figure 35.

8.19. Copy Total Cost

In the process of making a summary of the order costing report, leather and shoe material costs will be needed; therefore, the mentioned costs of each article were transferred to the 'Articles' worksheet with the help of the VBA code represented by the flowchart given in Figure 37.

Leather and shoe material costs of all the articles were transferred to the 'Articles' worksheet against their article numbers as can be seen in Figure 38.

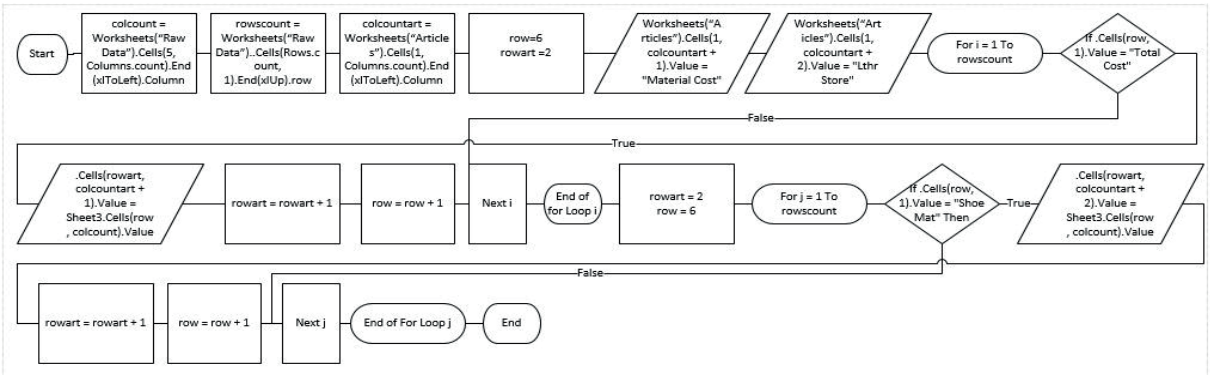


Figure 37: Flowchart representing the code for coping the total cost from 'Raw Data' worksheet to the articles worksheet.

	A	B	C	D	E	F	G	H	I	J	K
1	Row Labe	Brown	D/Blue	Expresso	Namibia	Navy	Grand Tot	Material Rows	Leather Rows	Material Cost	Lthr Store
2	2083 DBY				3		3	33	5	1287.992	2158.25
3	2979 DBY		182				182	39	3	124641.238	111660.2
4	3686 (VIV)			4489			4489	69	3	2791857.48	2363094.95
5	4543 CFS	1496					1496	56	2	1325624.827	869102.4
6	4600 DBY					3	3	34	4	1889.04	1827.4

Figure 38: The result produced by the code is represented in Figure 37.

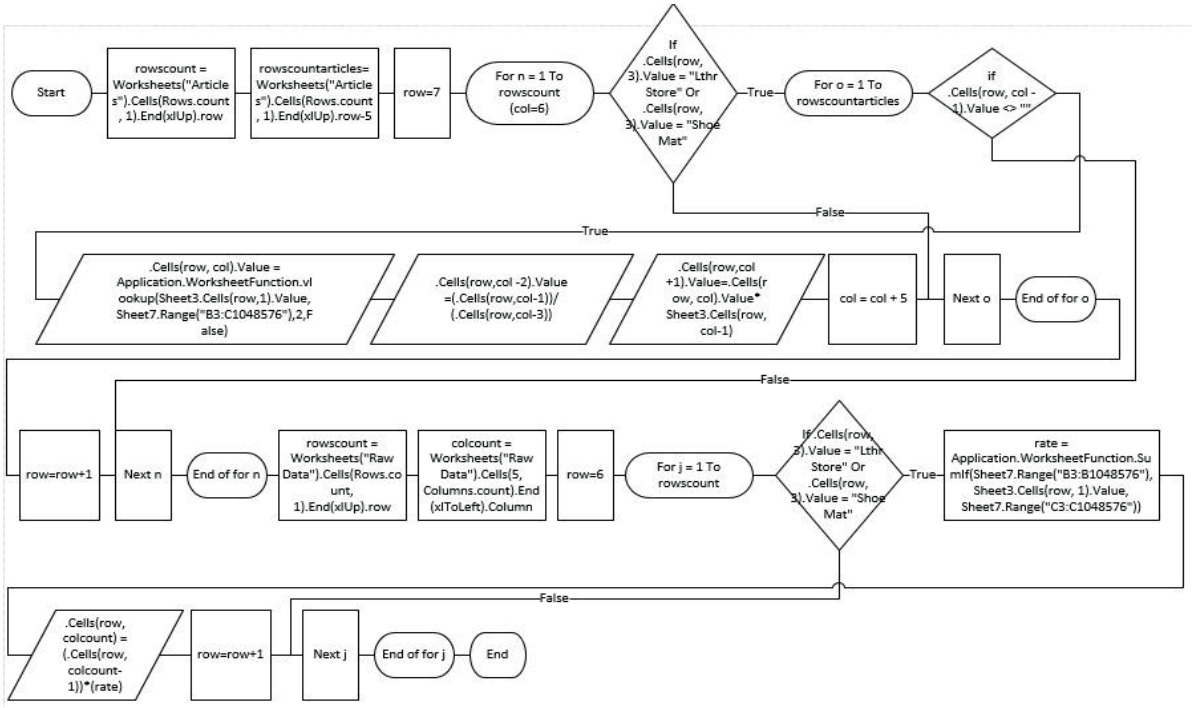


Figure 39: Flowchart representing the code for putting the missing prices of items in the 'Raw Data' worksheet.

8.20. Report Editing in Case of Missing Data

Since all the worksheets are integrated while the report is prepared with the help of VBA macros. Due to missing data i.e. material prices, the order costing report was not acceptable. This problem was confronted by the user that on the completion of the report if the material price of any item was missing then he was supposed to make the whole report again. To resolve that problem, a set of macros was programmed to edit the report when it was completely made. The VBA macros are presented in the form of flowcharts in the below-given headings.

8.21. Edit Rates of the Items If Remaining

VBA Code already presented in Figure 29 was modified and used at this stage. With the help of the VBA code, as presented in Figure 39, material price from the 'Mat Price List' worksheet was picked against the various items of each article. At the same time,the individual cost of each item of each color for an article and the total cost of each item in the article was calculated. Both costs were calculated for whole items and articles in the same way as shown in Figure 30.

8.22. Put Totals, Eliminate Zeros and Copy Total Cost

Total leather cost and the shoe material cost were calculated again after the recalculation of the cost of items. The same VBA code was used for putting the totals as shown in the flowchart given in Figure 33. After putting the totals, unnecessary zeros were erased by the use of code as presented in the flowchart given in Figure 35. Similar to the initial procedure, the total leather and shoe material costs of each article which were put in the 'Articles' worksheet were replaced by new total cost values. VBA code for transferring the total costs was used as same as presented in the flowchart given in Figure 36.

8.23. Copy Paste Result of the Order Costing Data

After some passage of time of preparation of order costing report, the post order costing report is prepared when the order is complete; the objective of making two reports of the same order is to see the difference between the estimated and actual cost incurred on the article; so that extra incurred cost on the article can be highlighted. In this regard, when the whole order costing report is prepared except its summary; then the data to be used in the post order costing report is prepared and it is copied in the 'PCS Final Result' worksheet sot that it can be used at the time of preparing the post order costing report.

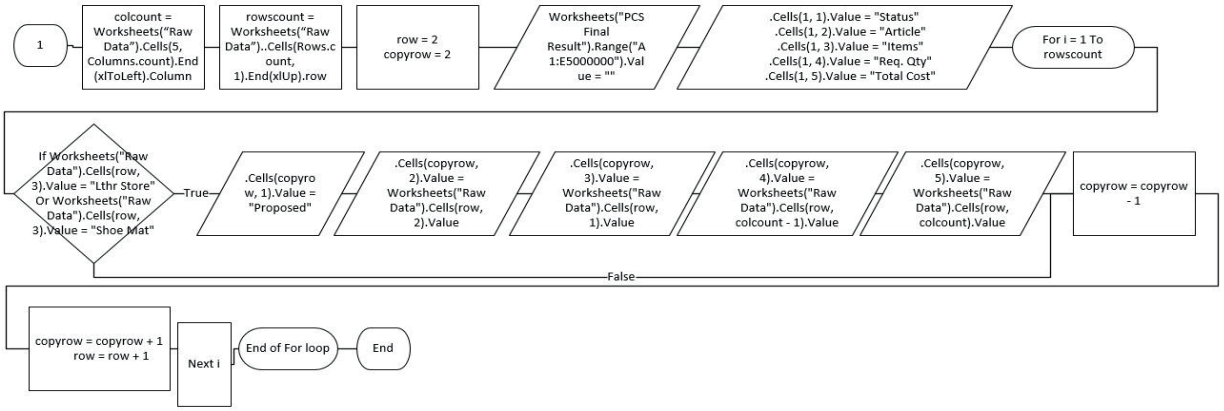


Figure 40: Flowchart representing the code for preparing the data of order costing report for the post-order costing report and paste it into the 'PCS Final Result' worksheet.

	A	B	C	D	E
1	Status	Article	Items	Req. Qty	Total Cost
2	Proposed	2083 DBY	BuffLining Snuffed veg0.7-0.9 mmBrown	4.19	356.15
3	Proposed	2083 DBY	BuffPet1.4-1.6 mmNavy	1.64	254.2
4	Proposed	2083 DBY	CowPeach Soft1.4-1.6 mmNamibia	0.16	34.4
5	Proposed	2083 DBY	CowPeach Soft1.6-1.8 mmNamibia	6.45	1419
6	Proposed	2083 DBY	GoatHeel Grip0.5-0.7 mmBrown	1.05	94.5
7	Proposed	2083 DBY	Alarm ChipMicro PakDefaultGreen	3	21
8	Proposed	2083 DBY	ChemicalCrazy Horse(SQ6040)DefaultDefault	0.02	16
9	Proposed	2083 DBY	ChemicalEthylestateDefaultDefault	0.01	3
10	Proposed	2083 DBY	ChemicalKeck Priemer 705DefaultDefault	0.12	58.2
11	Proposed	2083 DBY	ChemicalLatexDefaultWhite	0.08	32.8
12	Proposed	2083 DBY	ChemicalMethylEthylKetone(MEK)DefaultDefault	0.02	8
13	Proposed	2083 DBY	ChemicalPasting Solution LtrDefaultYellow	0.07	21.7
14	Proposed	2083 DBY	ChemicalTPR FinishesDefaultNatural	0.04	28
15	Proposed	2083 DBY	ClothCrimping Cloth LocalDefaultWhite	0.27	29.7
16	Proposed	2083 DBY	ElasticImpElastic Imported80 mmD/Brown	0.33	67.32
17	Proposed	2083 DBY	EyeletRondEyeletsGunMetal BBrown	24	35.04
18	Proposed	2083 DBY	FoamFoam10mmGrey	0.04	1.6
19	Proposed	2083 DBY	FoamFoam4mmWhite	0	0
20	Proposed	2083 DBY	PackngGen.Nylon String5"White	3	0.45
21	Proposed	2083 DBY	PackngTapePacking Tape Regular7 cmL/Brown	0.07	7
22	Proposed	2083 DBY	PictogramLthr+Lthr+Other2.5x2 cmGolden	3	7.5
23	Proposed	2083 DBY	RbrFomSockRubber Foam Socks3 mmBeige	0.15	26.4
24	Proposed	2083 DBY	ShetWintexInsole Wintex Sheet1.5 mmDefault	0.13	39
25	Proposed	2083 DBY	Shoe BoxDubarry340x210x12Blue	3	204
26	Proposed	2083 DBY	Sht BackCTSheet Back Counter221.2 mmDefault	0.06	39
27	Proposed	2083 DBY	SteelShankSteel Shank4"Default	6	21
28	Proposed	2083 DBY	StickerShoe Box Stckr DubarryDefaultWhite	3	10.5
29	Proposed	2083 DBY	Tag CardTag Card Dubarry65x45 mmGreen/Blue	3	6
30	Proposed	2083 DBY	TapeNnStrNone Stretchable Tape10 mmBlack	0.33	1.452
31	Proposed	2083 DBY	Thread H/SHand Stitch Waxy Thread Local1 mmOff White	9	9.27
32	Proposed	2083 DBY	Thread LocPolyester Thread Local10/3Beige 265	3	1.5
33	Proposed	2083 DBY	Thread LocPolyester Thread Local20/3Beige 265	39	7.02
34	Proposed	2083 DBY	Thread LocPolyester Thread Local30/3M/Brown262	24	2.16
35	Proposed	2083 DBY	Thread LocPolyester Thread Local40/3M/Brown262	15	1.2
36	Proposed	2083 DBY	Thread LocPolyester Thread Local40/3White 2000	12	0.96
37	Proposed	2083 DBY	TPRTPR Grain60L/Honey	0.6	195.6
38	Proposed	2083 DBY	TPRTPR Grain60White	0.96	357.12
39	Proposed	2083 DBY	WrappnRappWrapping Paper DubarryDefaultWhite	3	28.5

Summary | Raw Data | Cross Check | Articles | Sale Order Detail | Mat Price List | LOH | Transa

Figure 41: The result produced by the code is represented in Figure 40.

VBA code presented in the flowchart given in Figure 40, by the help of this code, article number, total required quantity of all items with their total cost are copied (see Figure 41) to the 'PCS Final Result' worksheet with the help of for loop (see Figure 40). Furthermore, in the first column of the worksheet, the proposal is written (see Figure 41) due to the requirement of the post-order costing report.

8.24. Prepare the Summary

After the copying, the data in 'PCS Final Result' for use of post-order costing report, a summary of the order costing report is required to be made. Blank 'Summary' worksheet can be seen in Figure 42.

	B	C	D	E	F
1					
2	Customer	Corporate	Sale order #	00021058 CFS	
4	Summary				
5	Variables		Total Qty	Total Cost	Cost/Pair
6	Sale price				
7	Leather Cost				
8	Material Cost				
9	Total Labour Cost				
10	Overheads				
11	B pair cost 1.5%				
12	Tooling cost				
14	Total Cost				
16	Article # 2083 DBY				
17	Variables		Total Qty	Total Cost	Cost/Pair
18	Sale price				
19	Leather Cost				
20	Material Cost				
21	Total Labour Cost				
22	Overheads				
23	B pair cost 1.5%				
24	Tooling cost				
26	Total Cost				

Figure 42: Look at the 'Summary' worksheet before pasting the summary table as per the number of articles.

To start the process of making a summary, article prices are necessary to be put in the 'Articles' worksheet in the row next to the last non-empty row. Every time the user does not need to put the price of articles 'L' column because the number of colors varies with each order. The task of putting prices was manual because they were obtained from the marketing department on the paper.

8.24.1. Copy Summary Format for Articles

When the prices are entered into the 'Articles' worksheet then the summary is prepared by clicking the command button i.e. Summary (see Figure 2). The last two macros for completing the summary are executed by clicking the mentioned command button.

The first macro is represented by the flowchart given in Figure 43. On the execution of the macro, the summary panels equal to the number of articles present in the 'Articles' worksheet is inserted in the summary worksheet (see Figure 44).

8.24.2. Put Values in the Summary Format

VBA code represented by the flowchart given in Figure 46 is used for putting all the required details in the summary as shown in Figure 47. Sale price, leather cost, and material cost are obtained from the last three columns of the 'Articles' worksheet (see Figure 45). Total labor cost is the sum of cutting, stitching, hand stitching, c.stitching, molding, job work, and lasting costs (see Figure 46). Total labor cost is copied from the 'LOH' worksheet against every article in the 'Summary' worksheet.

Overheads of the specific article are also copied from the 'LOH' worksheet against every article. B-Pair cost is calculated by computing the 1.5% of total material cost; it is the standard of the case company.

At the same time, the cost per pair of each parameter is calculated (see Figure 48).

	A	B	C	D	E	F	G	H	I	J	K	L
1	Row Labe	Brown	D/Blue	Expresso	Namibia	Navy	Grand Tot	Material Rows	Leather Rows	Material Cost	Lthr Store	Price
2	2083 DBY				3		3	33	5	1287.992	2158.25	2000
3	2979 DBY		182				182	39	3	124641.238	111660.2	2000
4	3686 (VIV)			4489			4489	69	3	2791857.48	2363094.95	2000
5	4543 CFS	1496					1496	56	2	1325624.827	869102.4	2000
6	4600 DBY					3	3	34	4	1889.04	1827.4	2000

Figure 43: Addition of article price in the 'Articles' worksheet.

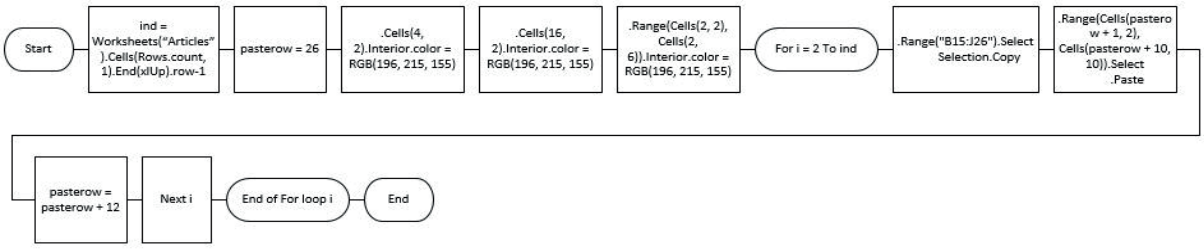


Figure 44: Flowchart representing the code for copying the format of an order costing summary as per the number of articles present in the order.

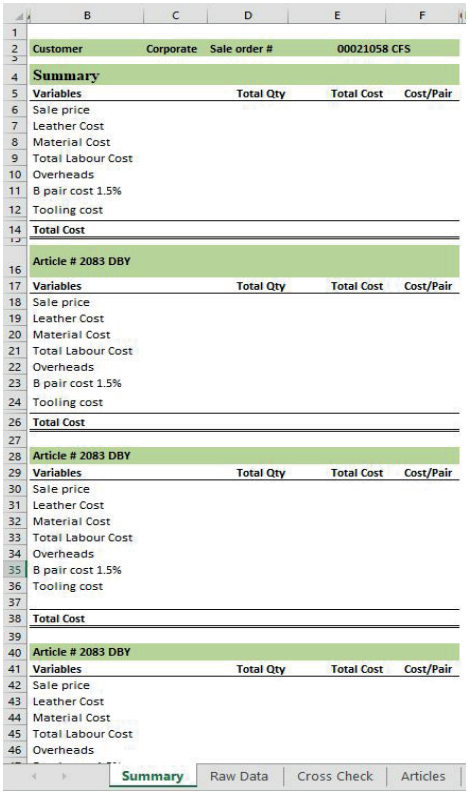


Figure 45: The result is produced by the code.

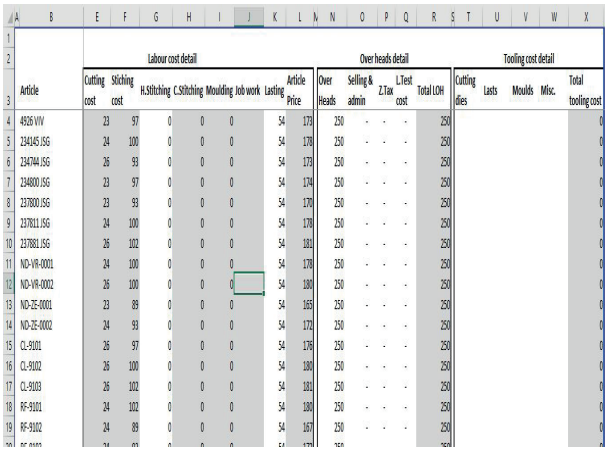


Figure 46: Look atthe LOH worksheet.

8.25. Time Taken by the Suggested Method to Make the Report

A Time study of the order costing report was conducted when it was completely implemented. Time study for the order costing report was carried out accordingly with the time taken by each command button (see Figure 2) to execute the code at its back. The time study was conducted on those orders which were consisted of one article with only one color.

Notations

c1= Download transaction from Microsoft Dynamics AX into Microsoft Excel

c2= Time consumed to take out the articles

c3= Delete the pivot table

c4= Time consumed to organize raw data

c5= Delete the pivot table

c6= Time consumed to finalize the report

c7= Time consumed to add the price

c8= Time consumed to add the values of labor cost, overheads, and tooling cost

c9= Time consumed for making the summary

At the very first, basic data from Microsoft Dynamics AX is downloaded in Microsoft Excel, then articles are taken out along with their colors by clicking the 'Articles?' command button (see Figure 3); pivot table is deleted manually; command button 'Org. Data' is clicked and then the pivot table is deleted manually. Furthermore, the command button 'Finalize Report' is clicked to prepare the 'Raw Data' worksheet completely; after the completion of the 'Raw Data' worksheet, article prices and labor cost are added into the specific worksheets as mentioned earlier in previous headings. In last, the command button 'Summary' is clicked to make the summary of the report and with this click, the order costing report is completed. The total time incurred on the report by the suggested method was calculated to be 136.2 sec (2.45 min).

Table 2: Time study of the various activities involved in making the order costing report as per the suggested method.

Activity	Obs.1 (Sec)	Obs.2 (Sec)	Obs.3 (Sec)	Obs.4 (Sec)	Obs.5 (Sec)	Obs.6 (Sec)	Obs.7 (Sec)	Obs.8 (Sec)	Obs.9 (Sec)	Obs.10 (Sec)	Mean Time (Sec)
c1	47.7	39.5	43.8	47.0	39.0	31.2	41.4	43.6	43.9	40.0	41.7
c2	4.48	5.63	4.29	5.12	2.86	4.67	5.51	3.47	6.09	4.92	4.70
c3	4.66	3.92	7.26	5.16	4.14	5.24	6.23	6.18	5.47	4.5	5.276
c4	10.56	4.5	7.74	7.31	9.72	8.25	9.09	9.64	5.82	12.88	8.55
c5	4.66	3.92	7.26	5.16	4.14	5.24	6.23	6.18	5.47	4.5	5.276
c6	13.0	8.36	10.6	9.28	13.7	12.4	10.6	10	8.05	10.3	10.6
c7	5.22	4.63	3.76	4.48	4.49	4.24	3.5	4.72	3.82	3.78	4.26
c8	58.2	58.9	65.4	46.3	62.9	66.5	60.9	62.9	67.1	60.5	61.0
c9	5.47	5.16	5.3	6.03	5.56	5.38	4.75	4.99	4.96	5.61	5.32
Total											146.682

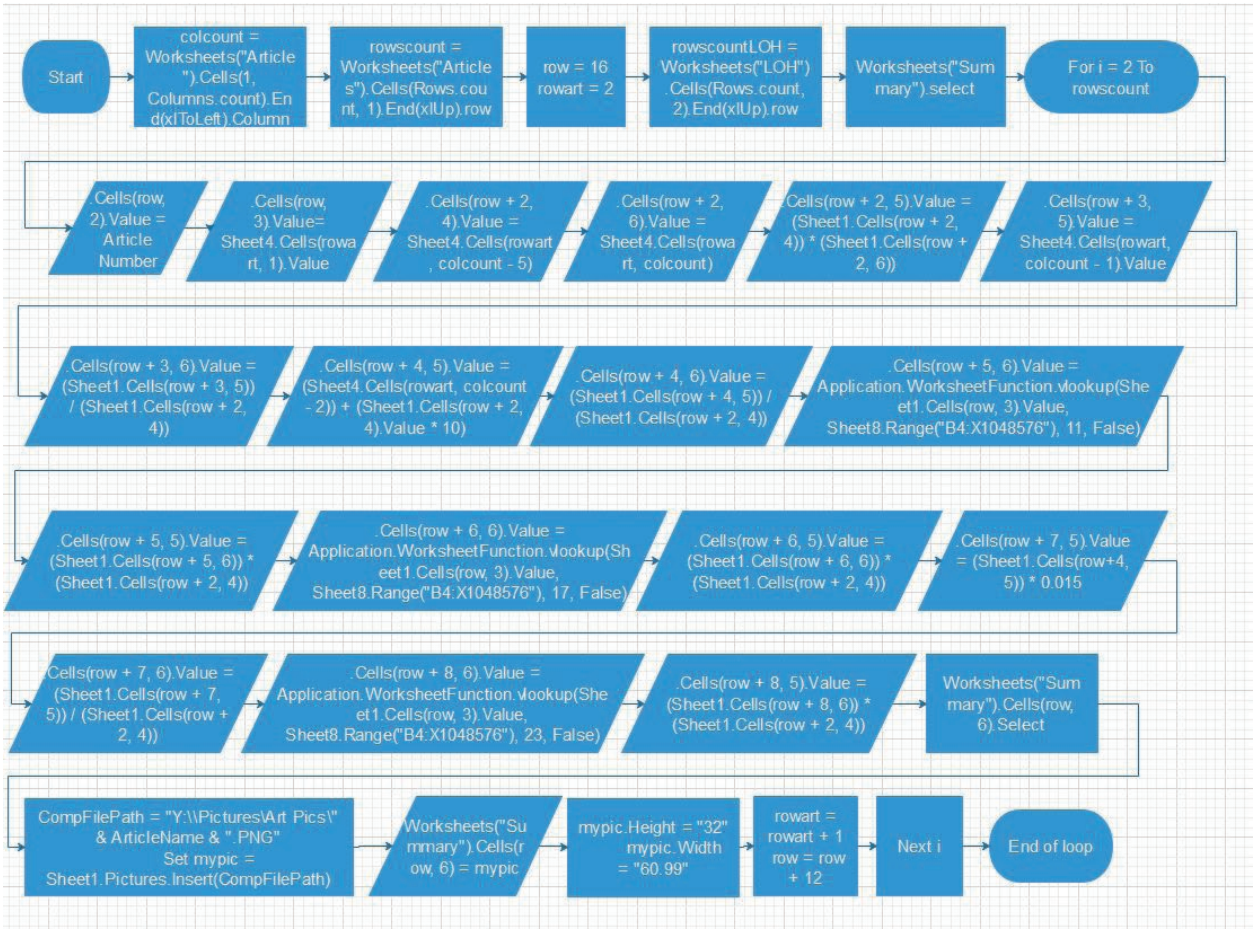


Figure 47: Flowchart representing the code for putting the values in the summary of an order costing report in the 'Summary' worksheet.

	B	C	D	E	F
1					
2	Customer	Corporate	Sale order #	00021058 CFS	
4	**Summary**				
5	**Variables**		**Total Qty**	**Total Cost**	**Cost/Pair**
6	Sale price		6,173	12,346,000	2,000
7	Leather Cost			3,347,843	542
8	Material Cost			4,307,031	698
9	Total Labour Cost			1,338,158	217
10	Overheads			1,543,250	250
11	B pair cost 1.5%			64,605	10
12	Tooling cost			52,360	8
14	**Total Cost**		14%	10,653,247	1,726
16	**Article # 2083 DBY**				
17	**Variables**		**Total Qty**	**Total Cost**	**Cost/Pair**
18	Sale price		3	6,000	2,000
19	Leather Cost			2,158	719.42
20	Material Cost			1,318	439.33
21	Total Labour Cost			587	196
22	Overheads			750	250
23	B pair cost 1.5%			20	7
24	Tooling cost			0	-
26	**Total Cost**		19%	4,833	1,611
28	**Article # 2979 DBY**				
29	**Variables**		**Total Qty**	**Total Cost**	**Cost/Pair**
30	Sale price		182	364,000	2,000
31	Leather Cost			111,660	613.52
32	Material Cost			126,461	694.84
33	Total Labour Cost			31,506	173
34	Overheads			45,500	250
35	B pair cost 1.5%			1,897	10
36	Tooling cost			0	-
38	**Total Cost**		13%	317,025	1,742
40	**Article # 3686 (VIV)**				
41	**Variables**		**Total Qty**	**Total Cost**	**Cost/Pair**
42	Sale price		4,489	8,978,000	2,000
43	Leather Cost			2,363,095	526.42
44	Material Cost			2,836,747	631.93
45	Total Labour Cost			926,729	206
46	Overheads			1,122,250	250

Summary | Raw Data | Cross Check | Articles

Figure 48: The result produced by the code is represented in Figure 47.

9. Comparison of Existing And Suggested Methods

Preparation of the order costing (Order of one article with color) in the old/existing method takes 1042.367 sec (17.37 min) whereas, by the new method, it takes 146.682 sec (2.45 min). 85.92% of the time used to be incurred on the report manually was saved by the initiation of the suggested template. The suggested method consists of the template containing an interesting and user-friendly interface with the help of which all the macros are executed. There was the chance of error in the report if prepared the old way, while there is no chance of error if the user is properly guided to use the new method.

10. Discussion

In every small and medium enterprise, employees are hired to make daily, monthly, quarterly and yearly reports in Microsoft Excel. Manual operation in Microsoft Excel takes too much time for employees and there are greater chances of error in manual work. In this regard, software providing companies have kept the feature automation in office applications i.e. word, Microsoft Excel and power point, MS project, etc. Therefore, VBA, VSTO, ActiveX, and many more technologies have been developed by Microsoft as per the needs of users (Ding et al., 2017) (Porter & Stretcher, 2012). VBA technology is provided

in numerous software applications on the platform of windows (Kuka & Karamani, 2011; Norton & Tiwari, 2013; Harahap & Azmi, 2017). Nowadays, companies promote their employees to gain knowledge and skills of using Microsoft Excel along with VBA (Chatvichiencha, 2015). VBA technology is about the development and customization in the integrated development environment (IDE) in office application for simplification and automation of complicated and repeated work respectively (Ding et al., 2017; Evensen, 2014; Minto, 2009; Harahap & Azmi, 2017; Kuka & Karamani, 2011). It is used to automate the routine processes which are performed in current office productivity applications (Ding et al., 2017; Chatvichiencha, 2015). The present research aimed to eliminate every single manual operation and whole the report was automated. Userforms are used in VBA for taking input from the user (Evensen, 2014). In the present work, the author used Combobox on the userform to take input (the report he wants to work on) from the user. Userforms can also have code and actions at their back to perform the tasks automatically (Evensen, 2014; Harahap & Azmi, 2017; Kalwar & Khan, 2020b). As in order costing report, two userforms are made with command buttons having macros at their back to perform the programmed tasks (each macro for each task) with just a click. Bartoszewicz and Wdowicz (2019) redesigned and implemented process for data migration and analysis by using VBA; which was more flexible and faster and with the help of which the whole process of the complex analytical report was sped up (operation time reduced from 2 hours to 5 minutes) (Bartoszewicz & Wdowicz, 2019). Cirujano and Zhu (2013) automated the manpower resource planning report by the help of VBA in Microsoft Excel; manual report used to take 30 working hours if it was made an experienced reporter but after automation it takes 10 minutes (99.4% less time) (Cirujano & Zhu, 2013). Kalwar and khan (2020) saved 75% of the employees time used to be spent for making the procurement rerpot manually (Kalwar & Khan, 2020b). In the same way, after automation, order costing report took 85.92% less time as compared to the manual method. Yan and Wan (2017) developed an application by the use of Microsoft Excel VBA for an automatic calculation and generation of bill of material (BOM) of the transmission line. Efficiency and accuracy are greatly improved by the design and application of the template and errors in the process of making total steel BOM were reduced (Yan & Wan, 2017). Abidin et al., (2013) calculated WQI and API automatically with the help of VBA. The application provided a practical approach for the calculation of WQI and API; at the same time, calculation time and error were reduced after the automation (Abidin et al., 2015). Similarly, in the order costing report, the chances of error are reduced to zero; if the input data was correct then there was no need to worry about the errors in the result.

11. Conclusion

The template was tested by preparing the report with the order of varying articles and colors so that its accuracy and validity could be checked. The implementation of the suggested method took 2 months; the long duration was incurred because of troubleshooting and validation of calculations. In the implementation period, the template was amended 50 times due to calculation and formatting errors. After the implementation of the suggested method, a usual long queue of order costing reports on the hand costing department was reduced to zero. After the implementation of the suggested method, the user was supposed to download the data from Microsoft Dynamics AX, collect the prices of various articles and standard allowed minutes (SAMs) of cutting and stitching of particular articles. After the mentioned data collection, he was only supposed to open the template and click the command buttons provided on the userforms to complete the report. Preparation of the report (one article with only one color) by the new method takes 85.92% less time than the old method. The time-saving factor and its accuracy compelled the user to implement the suggested method for making the order costing report. It was really hard for the new employee to learn and prepare the order costing report; in this regard, the suggested method will be conveniently learned and used by the new users due to its user-friendliness and easy interface.

12. Implications

The user of the template was not educated enough to edit the code in case of any error. At the same time, there was no one in the entire factory capable enough to deal with VBA; the researcher voluntarily offered his services to teach VBA but due to the congested schedule, no one could have learned about the subject. Still, there is no error in the template but there is the probability (even it is quite less).

13. Limitations

With the small order i.e. from 100-40000 pairs with 20 colors, the suggested method takes reasonable time but when the order increases from the mentioned range, it takes too much to complete the report. It is because too much data to be processed in a longer range of rows. Since Microsoft Excel is a small application as compared to a database like SQL Server and Oracle; therefore, it will certainly be slow when the data is big and the process is long. This is the biggest limitation of the automated order costing template.

14. Future Work

As mentioned earlier, the suggested method takes too much time when the data is big; therefore, it will more convenient to initiate the module of an order costing in the Microsoft Dynamics AX. If this happens too much time off employees will be saved because of the integration of various departments (i.e. sales, production, planning, and purchasing).

15. Conflict of Interests

There is no conflict of interest among the authors of this research paper.

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