A Peer Reviewed (Refereed) International Journal Impact Factor 4.308 http://www.ijbems.com

ISSN:2941-9638

## PERFORMANCE IMPROVEMENT OF SALE ORDER DETAIL PREPARATION BY USING VISUAL BASIC APPLICATIONS: A CASE STUDY OF FOOTWEAR INDUSTRY

#### **Muhammad Ahmed Kalwar**

Post Graduate Alumini (MUET) & Assistant Manager Production Shafi Private Limited, Lahore, Punjab, Pakistan \*kalwara.muhammad.ahmed@gmail.com

#### Hussain Bux Marri

Meritorious Professor & Ex-Chairman Department of Industrial Engineering and Management Mehran University of Engineering and Technology Jamshoro, 76062, Sindh, Pakistan.

#### Muhammad Ali Khan

Post Graduate Student & Assistant Professor Department of Industrial Engineering & Management Mehran UET, Jamshoro, 76062,Sindh, Pakistan

#### ABSTRACT

**Purpose**: Purpose behind the automation of sale order detail report was to decrease the workload of the employee and at the same time, minimization of non-value added reporting tasks was also the target.

**Methodology**: Sale order detail report was used to be made at the planning department of ABC footwear Company. Authors learnt the manual steps and method so that they could translate them into the visual basic of applications (VBA) code for its automation in excel. Visual basic editor was used for the compilation and to run the coded macros. Time of each of the manual activities was recorded before and after the report automation so as to compare the efficiency of methods.

**Findings**: Since, the time study of both (manual and automated) methods was compared and the comparison indicated that the automated method took 84.42% less time than manual method. Furthermore, the accuracy of the report if prepared by new method was checked to be 100%. Most importantly, no single manual operation was left to be performed by the user in the report.

**Importance**: Human mind bears a limited workload and due to fatigue, irritation and frustration, it can cause an error and if that error is the part of big plan and associated with some amount of cost then that will not be bearable. Therefore, such tasks and activities should be automated because machine cannot be mistaken if the code and its execution is proper. In this regard, sale order detail report was automated at the planning department of ABC footwear Company.

A Peer Reviewed (Refereed) International Journal

ISSN:2941-9638 Impact Factor 4.308 http://www.ijbems.com

**Implications**: Since, automation in excel reporting is not the permanent solution when there is the usage of Microsoft Dynamics AX 2012 in the company. Automation in excel is a good solution but it is not counted for the long run. Therefore, it was suggested to the company for the incorporation of the report into Microsoft Dynamics AX 2012.

Limitations: Major limitations of the present automated template included: excel file can get corrupted easily, if any error comes, there was no one in the company who could trace and solve that error.

**Originality:** Many researchers have used VBA for numerous purposes in the wide variety of works at the different platforms. Already conducted work includes: one of the researchers integrated production planning module of SAP with Excel for data analysis, another transferred the image data in excel spreadsheet and one of patents indicate that manpower resource planning report was automatically generated in MS project by use of VBA. In the light of conducted literature review, it was indicated that besides implementation of mathematical model by using VBA in excel, no work on the full report automation has been conducted in excel by the use of VBA. In this regard, due to immense need and highlighted research gap present research paper was organized.

## **INTRODUCTION**

VBA is a simple but powerful tool developed by Microsoft's event-driven programming language which is used for the automation of manual operation. It gives 100% accurate results and requires a very little time.[1]. Visual Basic for Applications is used generally for algebraic calculations just like creating variables, interacting with different equations and creating results [2][3]. VBA or Macro programming is diverse group of instruction through which complex user specified operations are automated in MS excel[4]. No or a very little cost is needed and complex with substantial accuracy can be conducted during when applications is being programmed in excel VBA. Moreover a less skilled employees can easily run VBA in excel and operate many tasks and applications and can get accurate results. [5]. It can be run easily in just single click. By using Macro a user can begin user-defined functions and automate all spreadsheet tasks [6]. Visual basic editor and VBA are different as compared to the spreadsheet environment and excel formulae respectively [6]. When we talk about spreadsheet environment and excel formulae Visual basic editor and VBA are quite different [2]. VBA is effective and efficient in such a way that it saves time, gives accurate results, lower the formulae burden and secure the worksheets. The facility of VBA is being facilitated to many other application like access, word, excel, and power point. MS excel is accepted as one of the major application as it is the standard for spreadsheets in the world of industry and at the same time, VBA can be used comfortably [7]. Current research paper shows the automation of material delivery time analysis report by using excel VBA. Therefore ABC footwear company thought to use VBA in excel to automate some of the office work due to heavy workload f manual work at the purchase center of ABC footwear company. In that case employees will be given enough time for relaxation and learning other activities. So it is the effective way to use VBA and at the mean time mistakes

A Peer Reviewed (Refereed) International Journal Impact Factor 4.308 http://www.ijbems.com

were also focused to be minimized in the calculation results and material delivery time analysis report was also automated.

## LITERATURE REVIEW

As per demand of sale order detail at planning and costing department of ABC Company, design and formulae were kept to be the exact but the manual operation from the report were totally escaped. Provision report and purchase order report ere automated through a research observed by Kalwar and Khan (2020). The time of report was reduced from 2096 seconds to 520 seconds. ZainalAbidin et al., (2015) summed up Air pollutant Index (API) and water quality index (AQI) with the help of VBA in excel. Calculating indices was done with the help of VBA. Moreover, coded detail of the index was calculated in order to highlight value of index by itself shown along with it [1]. Through VBA in excel Ahmadi et al., (2010) implemented a dairy model. The execution of the CTR Dairy model was carried out as research with the use of VBA in excel by Ahmadi et al., (2018). CTR dairy is a vigorous simulation model for grazing lactating dairy cows that is used to predict the overall milk production and profits on various parameters i.e. the absorption of nutrients under intermittent schedules of feeding and luminal digestion. In the last few years, impulsive driving came on the surface before the government and general masses[8][9]. The CTR dairy model was translated into excel VBA due to infrequent clients and discontinuation of SMART software; to transform input in to output. It was turned into existence to the broad range of farmers, researchers and advisors, dairy nutrition consultants through this research[10]. Using VBA in excel Junior et al., (2011) find out the result of Leak Analysis Program 5 (RELAP5) and Reactor Excursion through post-processing developed. Through VBA Rushit Hila (2009) highlighted to be significant to pace up output data analysis[11]. It was also programmed by in VBA excel in order to identify outliers in the data and arrangement of data by itself. The number of steps were automated for verifying data and cleaning it before importing it into MS access (used as a database) [12]. Cirujano and Zhu (2013) created a advanced method of manpower planning report automatically in Macro programming. Furthermore with the help of new methods Roles, assignments and schedules of the engineers for various projects were collected. .Later on, collected information was compiled, analyzed and organized. After getting validated in consulting firm with more than hundred employees the method ensured its significance. It highlighted that manpower planning report could be deduced through it; hence, it would result in reducing time and cost [7]. Sato and Yokoyama (2001) set An application to transfer an image data to a worksheet click of Web-icon from the data set was developed as an application by using VBA in excel [13]. For calculation of logic program and packaging Lessa et al., (2016) used visual basic for application (VBA) in excel to automate a practical mathematical model. The designs of graphics were created so that packages get filled by itself easily [14]. Moreover through Visual Basic for Application H. Evenson (2014) execute instrument communication in excel for the very first time in 2014 [15]. By using excel VBA an automatic report generating system was invented in MS project by Donald E. Blattner and Valrico, FL (2007). The invented system pave the way for users to select, format filter and sort the report with the help of dialogue box highlighted on the screen [12]. Through VBA mapping rules were created by Wettlaufer (2010). One macro was programmed for each report. In

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308 <u>http://www.ijbems.com</u> ISSN:2941-9638

Vol.3. Issue 1. 2021 (March)

another spreadsheet expected values were written that were expected value spreadsheet. Later on, it moved the patients follow-up to the merline net server for processing the data and processed patient follow-up session was generated which included reports package in the winrar file [12]. For making engineering students comprehend the analysis of novel freezing technology VBA in excel was used by Norton and Tiwari (2013) [3]. Through excel VBA new method was proposed for the analysis of production process, its automation and visualization was containe on the synchronization of production planning module of SAP enterprise resource planning (ERP) proposed by Bartoszewicz and Wdowicz (2019). The novel process for data analysis and migration was re-engineered and executed- which was more resilient and swift and with the assistance of which thorough process of convoluted analytical report was paced up ( reduction in time to 5 minutes from 2 hours) [14]. Using excel VBA a research was conducted with the aim and objective to advance the application that could make the mediocre level rainwater conveyance system- using rational method as highlighted in MSMA 2 by Harahap and Azmi (2017) [15]. Moreover with the usage of VBA excel for an automatic calculation and generation of bill of material (BOM) of transmission line was prepared by Yan and Wan (2017). Accuracy and efficiency are widely upgraded. with the application and design of the template and errors in the process of designing of total steel BOM were reduced [16]. Provision report and purchase order report ere automated through a research obsereved by Kalwar and Khan (2020) at the organization and costing department of ABC Footwear Company. The time of report was reduced from 2096 seconds to 520 seconds[17]. Mustafa and Hatemi-J, 2020 created a dynamic model in order to learn the concept of lag order and the developed model was to be used for financial data computation and statistics` classes. Through the VBA in excel the complex process of finding optimal lag value was automated which was a multi-variate and multi-step process .Furthermore, by the usage of excel in VBA multivariate dynamic model was estimated and at the meantime, the optimal lag value was found through the mentioned program [18].

## **RESEARCH GAP**

Many researchers have used VBA for numerous purposes in the wide variety of works at the different platforms. Already conducted work includes: one of the researchers integrated production planning module of SAP with Excel for data analysis, another transferred the image data in excel spreadsheet and one of patents indicate that manpower resource planning report was automatically generated in MS project by use of VBA. In the light of conducted literature review, it was indicated that besides implementation of mathematical model by using VBA in excel, no work on the full report automation has been conducted in excel by the use of VBA. In this regard, due to immense need and highlighted research gap present research paper was organized.

## NEED FOR AUTOMATION

As for the as the small orders i.e. below 10000 shoe pairs, are concerned, their sale order detail report is prepared in 6 to 7 min but when the big order i.e. 80000, 200000 shoe pairs; then sale order detail takes more time and the chance of error is also greater. Therefore, it was the extreme need to automate the sale order detail in order to save the employees` time and chance of error

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308 http://www.ijbems.com ISSN:2941-9638

can be avoided. For the automation of report, visual basic for applications (VBA) in excel was used.

## **RESEARCH METHODOLOGY**

Basic methods which were used in the present research were time study of tasks performed during report formation before and after automation and programing of manual tasks of sale order detail report in MS excel by using VBA.

## **Data Collection**

Only one type of data was used in the present research which was only collected to reflect the performance of automated method of report formation. The data included the descriptions of manual operations and those were collected from the concerned employee by conducting an interview. The time of tasks which were performed to make the report was collected by the help of stop watch. Ten observations for each of the task were collected. The method and process of report formation was learnt by authors from the concerned person. Furthermore, snipping tool in windows 10 was used to take snaps of the excel screen on order to show the output of automated sale order detail (ASOD) version 1.

## **Data Analysis**

The data (task descriptions and collected observations of time) were put into MS excel for calculation of average time of each of the task and total time of report formation. The data was present in the paper in a tabular form for both methods and in last the comparison of both method was conducted.

## **Tool Used for Report Automation**

Manual operation of the sale order detail report was automated by the help of visual basic for applications in excel as mentioned earlier. In order to execute the macros; an interface (based on one user-form) was design in visual basic editor of excel. For the automation of manual operation if statements, for loop, do while loop were used to perform the various tasks in the automated template.

## **OLD METHOD**

Old method is consisted on the series of the tasks performed manually in excel i.e. delete columns, insert rows, put headers on the column, put totals etc. The purpose of sale order detail is to sum the total pairs in one assortment; and the assortment is the series of given ordered sizes in the order as can be seen in the fig.1 from cell D2 to cell D9. Total number of pairs in first assortment is 480 (see fig.1)

#### **Basic Data**

Data presented in the fig.1 is required data for making sale order detail. Basic data is consisted of the production number, article number, size, quantity and sole (column H) to be used in the articles. The mentioned fields are needed for the preparation of sale order detail.

A Peer Reviewed (Refereed) International Journal Impact Factor 4.308 <u>http://www.ijbems.com</u> Vol.3. Issue 1. 2021 (March)

1	A	В	С	D	E	F	G	н	1	J	к	L	M
1	Production 💌	Item number 💌	Color 💌	Size	Quantity 💌	Status 💌	Ref 1 💌	Ref 2 🗾	Reference number 💌	Remain status	Delivery	Reference type 💌	Locked for rescheduling
2	Prod_00185567	2964 PSI	D.Grey	39	6.00	Created		Eva Dynamic			9/24/2019		No
3	Prod_00185568	2964 PSI	D.Grey	40	48.00	Created		Eva Dynamic			9/24/2019		No
4	Prod_00185569	2964 PSI	D.Grey	41	80.00	Created		Eva Dynamic			9/24/2019		No
5	Prod_00185570	2964 PSI	D.Grey	42	110.00	Created		Eva Dynamic			9/24/2019		No
6	Prod_00185571	2964 PSI	D.Grey	43	108.00	Created		Eva Dynamic			9/24/2019		No
7	Prod_00185572	2964 PSI	D.Grey	44	50.00	Created		Eva Dynamic			9/24/2019		No
8	Prod_00185573	2964 PSI	D.Grey	45	50.00	Created		Eva Dynamic			9/24/2019		No
9	Prod_00185574	2964 PSI	D.Grey	46	28.00	Created		Eva Dynamic			9/24/2019		No
10	Prod_00185575	2964 PSI	D.Grey	39	6.00	Created		Eva Dynamic			9/24/2019		No
11	Prod_00185576	2964 PSI	D.Grey	40	48.00	Created		Eva Dynamic			9/24/2019		No
12	Prod_00185577	2964 PSI	D.Grey	41	80.00	Created		Eva Dynamic			9/24/2019		No
13	Prod_00185578	2964 PSI	D.Grey	42	110.00	Created		Eva Dynamic			9/24/2019		No
14	Prod_00185579	2964 PSI	D.Grey	43	108.00	Created		Eva Dynamic			9/24/2019		No
15	Prod_00185580	2964 PSI	D.Grey	44	50.00	Created		Eva Dynamic			9/24/2019		No
16	Prod_00185581	2964 PSI	D.Grey	45	50.00	Created		Eva Dynamic			9/24/2019		No
17	Prod_00185582	2964 PSI	D.Grey	46	28.00	Created		Eva Dynamic			9/24/2019		No
18	Prod_00185583	2964 PSI	D.Grey	39	6.00	Created		Eva Dynamic			9/24/2019		No
19	Prod_00185584	2964 PSI	D.Grey	40	48.00	Created		Eva Dynamic			9/24/2019		No
20	Prod_00185585	2964 PSI	D.Grey	41	80.00	Created		Eva Dynamic			9/24/2019		No
21	Prod_00185586	2964 PSI	D.Grey	42	110.00	Created		Eva Dynamic			9/24/2019		No
22	Prod_00185587	2964 PSI	D.Grey	43	108.00	Created		Eva Dynamic			9/24/2019		No
23	Prod_00185588	2964 PSI	D.Grey	44	50.00	Created		Eva Dynamic			9/24/2019		No
24	Prod_00185589	2964 PSI	D.Grey	45	50.00	Created		Eva Dynamic			9/24/2019		No
25	Prod_00185590	2964 PSI	D.Grey	46	28.00	Created		Eva Dynamic			9/8/2019		No
26	Prod_00185591	2964 PSI	D.Grey	39	2.00	Created		Eva Dynamic			9/24/2019		No
27	Prod_00185592	2964 PSI	D.Grey	40	34.00	Created		Eva Dynamic			9/24/2019		No
28	Prod_00185593	2964 PSI	D.Grey	41	55.00	Created		Eva Dynamic			9/24/2019		No
29	Prod_00185594	2964 PSI	D.Grey	42	93.00	Created		Eva Dynamic			9/24/2019		No
30	Prod_00185595	2964 PSI	D.Grey	43	75.00	Created		Eva Dynamic			9/24/2019		No
31	Prod_00185596	2964 PSI	D.Grey	44	37.00	Created		Eva Dynamic			9/24/2019		No
32	Prod_00185597	2964 PSI	D.Grey	45	37.00	Created		Eva Dynamic			9/24/2019		No
33	Prod_00185598	2964 PSI	D.Grey	46	19.00	Created		Eva Dynamic			9/24/2019		No
34	Prod_00185599	2964 PSI	D.Grey	39	2.00	Created		Eva Dynamic			9/24/2019		No
35	Prod_00185600	2964 PSI	D.Grey	40	4.00	Created		Eva Dynamic			9/24/2019		No
36	Prod_00185601	2964 PSI	D.Grey	41	6.00	Created		Eva Dynamic			9/24/2019		No
37	Prod 00185602	2964 PSI	D.Grey	42	8.00	Created		Eva Dynamic			9/24/2019		No

ISSN:2941-9638

Fig.1.Basic data for the preparation of sale order detail report

#### Notations

a=Download Data from Microsoft Dynamics AX

b=Delete columns from F to S

c=Put headers from columns F to I (Sole, Start Date, End Date, Reference Number)

d=Copy the data from the active sheet to another sheet

e=Insert row for putting 'Total Pairs'

f=Put Totals below each assortment

g=Put Grand Total

h=change row height of the occupied cells of the worksheet

Activities to be performed in excel during the preparation of sale order detail report are presented in the table 1 given below.

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)
a	59.28	44.44	52.44	55.7	47.23	42.13	48.34	42.62	43.61	62.36	49.82
b	3.14	2.88	2.61	2.62	2.77	3.08	3.12	3.01	2.6	3.18	2.901
с	18.27	13.04	14.92	14.35	14.45	11.81	12.68	15.55	18.79	13.61	14.75
d	8.73	10.76	7.52	8.21	8.08	9.82	10.84	8.69	9.43	10.09	9.217
e	3.9	4	4.52	4.69	3.73	3.61	3.87	3.34	4.25	3.61	3.952
f	5.06	5.25	5.3	4.8	5.21	4.66	4.84	5.05	5.52	5.11	5.08

Table 1. Time Study of all the activities of old method for preparing the sale order detail

A Peer Reviewed (Refereed) International Journal Impact Factor 4.308 <u>http://www.ijbems.com</u> ISSN:2941-9638 Vol.3. Issue 1. 2021 (March)

g	8.63	5.35	6.44	6.18	6.4	8.57	7.89	7.17	7.47	6.27	7.037
h	14.55	15.34	13.81	14.81	13.06	8.55	12.46	14.04	8.62	8.62	12.39

### Notations

T = Total Time of the Reprot n = number of assortments T = a + b + c + d + n (e + f) + g + h n = 35 T = 412.223 sec T = 6.87 minOld method of preparing the sale order detail used to take 6.87 min.

## SUGGESTED METHOD

Automated system contained the user interface for the execution of commands (see fig.2). There were VBA macros behind every command button (see fig.3). Macros were written in two different modules in VBA editor in MS excel and those macros were called behind the command button (see fig.3). The name of suggested template was kept to be automated sale order detail 1.0 (ASOD 1.0) as shown in the fig.2.

Designed Interface for Execution of Macros

For the execution of macros coded for the automation of sale order detail (SOD), a userform was designed containing one picture, three command buttons (Organize SOD, Final Result and Close) and one textbox for the taking the input of 'sale order number'. The userform appears on the screen when user press 'Ctrl + q'.

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308	http://www.ijbems.com	ISSN:2941-9638
•		



Fig.2.Userform designed for execution of macros

Macros on the back of these command buttons are presented in fig.3. there were eight macros (2 for command button 'organize SOD' and six for command button 'final result'.



Fig.3. Macros behind each of the command button of the userform presented in fig.2

#### **Needed Worksheets**

There are three worksheets which are used during the preparation of sale order detail. At the very first, data as downloaded from ERP is pasted into 'Raw Data' worksheet and after the execution of one macro, it is then transferred to 'Sale Order Detail' worksheet in order to calculate individual and collected total for the assortments.

INTERNATIONAL J MANAGEMENT ST A Peer Reviewed (Re	Vol.3. Issue 1. 2021 (March)				
Impact Factor 4.308	http://wv	vw.ijbems.com	ISSN:2941-9638		(,
	A F	Raw Data	Sale Order Detail	Rows	<ul> <li>(+)</li> </ul>

Fig.4. Needed worksheets for the automated sale order detail report

Since, it is very difficult to calculate total of the unknown range in excel; that's why the starting row of each assortment was printed (see fig.8) in the 'Rows' worksheet; so that, the range can be defined (as summation range is defined in summation formula by using *rownum* variable in 6.1.5) at the time of summation in 'Sale Order Detail' worksheet.

Macros behind Command Buttons

All macros are explained individually in below given headings.

Organize Sale Order

The code given below is used for the deleting the columns (F to S) and then for inserting the column headers on the columns from F1 to I1.

#### Sub OrganizeSaleOrder()

```
With Worksheets("Raw Data")

.Columns("F:g").EntireColumn.Delete

.Columns("G:R").EntireColumn.Delete

.Range("F1").Value = "Sole"

.Range("G1").Value = "Start Date"

.Range("H1").Value = "End Date"

.Range("I1").Value = "Reference Number"

End With
```

#### End Sub

1	A	В	С	D	E	F	G	Н	1		J
1	Production	Item number 💌	Color 💌	Size 💌	Quantity 💌	Sole 🔽	Start Date	🔻 End Date 💌	Reference Number	-	
2	Prod_00185567	2964 PSI	D.Grey	39	6.00	Eva Dynamic					
3	Prod_00185568	2964 PSI	D.Grey	40	48.00	Eva Dynamic					
4	Prod_00185569	2964 PSI	D.Grey	41	80.00	Eva Dynamic					
5	Prod_00185570	2964 PSI	D.Grey	42	110.00	Eva Dynamic					
6	Prod_00185571	2964 PSI	D.Grey	43	108.00	Eva Dynamic					
7	Prod_00185572	2964 PSI	D.Grey	44	50.00	Eva Dynamic					
8	Prod_00185573	2964 PSI	D.Grey	45	50.00	Eva Dynamic					
9	Prod_00185574	2964 PSI	D.Grey	46	28.00	Eva Dynamic					
10	Prod_00185575	2964 PSI	D.Grey	39	6.00	Eva Dynamic					
11	Prod_00185576	2964 PSI	D.Grey	40	48.00	Eva Dynamic					
12	Prod_00185577	2964 PSI	D.Grey	41	80.00	Eva Dynamic					
13	Prod_00185578	2964 PSI	D.Grey	42	110.00	Eva Dynamic					
14	Prod_00185579	2964 PSI	D.Grey	43	108.00	Eva Dynamic					
15	Prod_00185580	2964 PSI	D.Grey	44	50.00	Eva Dynamic					
16	Prod_00185581	2964 PSI	D.Grey	45	50.00	Eva Dynamic					
17	Prod_00185582	2964 PSI	D.Grey	46	28.00	Eva Dynamic					
18	Prod_00185583	2964 PSI	D.Grey	39	6.00	Eva Dynamic					
19	Prod_00185584	2964 PSI	D.Grey	40	48.00	Eva Dynamic					
20	Prod_00185585	2964 PSI	D.Grey	41	80.00	Eva Dynamic					
21	Prod_00185586	2964 PSI	D.Grey	42	110.00	Eva Dynamic					
22	Prod_00185587	2964 PSI	D.Grey	43	108.00	Eva Dynamic					
23	Prod_00185588	2964 PSI	D.Grey	44	50.00	Eva Dynamic					
24	Prod_00185589	2964 PSI	D.Grey	45	50.00	Eva Dynamic					
25	Prod_00185590	2964 PSI	D.Grey	46	28.00	Eva Dynamic					
26	Prod_00185591	2964 PSI	D.Grey	39	2.00	Eva Dynamic					
27	Prod_00185592	2964 PSI	D.Grey	40	34.00	Eva Dynamic					
28	Prod_00185593	2964 PSI	D.Grey	41	55.00	Eva Dynamic					

Fig.5.Result of above given code

A Peer Reviewed (Refereed) International Journal

Result of the code given above is presented in the fig.5.

Insert Heading of 'Total Pairs'

In order to insert the row after every assortment, do while loop was used with the condition of if the next cell value (downward) is less than the value in above cell; in case, the condition comes true then the row is inserted and the loop is forwarded with the increment of two. In case, condition comes false then the loop is forwarded with one increment as presented in the code below.

```
Sub PutHeadingOfTotalPair()
Dim row As Long
Dim rowscount As Long
rowscount = Worksheets("Raw Data").Cells(rows.Count, 1).End(xlUp).row
row = 2
  Do Until Worksheets("Raw Data").Cells(row, 1).Value = ""
    If Worksheets("Raw Data").Cells(row + 1, 4).Value < Worksheets("Raw Data").Cells(row,
4).Value Then
       With Worksheets("Raw Data")
         .rows(row + 1).Insert
         .Cells(row + 1, 1).Value = "Total Pairs"
         .Cells(row + 1, 1).Font.Bold = True
row = row + 2
      End With
    Else
row = row + 1
    End If
  Loop
With Worksheets("Raw Data")
    .Cells(row, 1).Value = "Grand Total"
    .Cells(row, 1).Font.Bold = True
End With
End Sub
```

Inserted rows can be seen in the fig.6 with the header of 'Total Pairs'.

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308

http://www.ijbems.com

ISSN:2941-9638

Vol.3. Issue 1. 2021 (March)

1	А	В	С	D	E	F		G	н	I.
1	Production 💌	Item number 💌	Color 💌	Size 💌	Quantity 💌	Sole	•	Start Date 💌	End Date 💌	Reference Number 💌
2	Prod_00185567	2964 PSI	D.Grey	39	6.00	Eva Dynam	ic			
3	Prod_00185568	2964 PSI	D.Grey	40	48.00	Eva Dynam	ic			
4	Prod_00185569	2964 PSI	D.Grey	41	80.00	Eva Dynam	ic			
5	Prod_00185570	2964 PSI	D.Grey	42	110.00	Eva Dynam	ic			
6	Prod_00185571	2964 PSI	D.Grey	43	108.00	Eva Dynam	ic			
7	Prod_00185572	2964 PSI	D.Grey	44	50.00	Eva Dynam	ic			
8	Prod_00185573	2964 PSI	D.Grey	45	50.00	Eva Dynam	ic			
9	Prod_00185574	2964 PSI	D.Grey	46	28.00	Eva Dynam	ic			
10	Total Pairs									
11	Prod_00185575	2964 PSI	D.Grey	39	6.00	Eva Dynam	ic			
12	Prod_00185576	2964 PSI	D.Grey	40	48.00	Eva Dynam	ic			
13	Prod_00185577	2964 PSI	D.Grey	41	80.00	Eva Dynam	ic			
14	Prod_00185578	2964 PSI	D.Grey	42	110.00	Eva Dynam	ic			
15	Prod_00185579	2964 PSI	D.Grey	43	108.00	Eva Dynam	ic			
16	Prod_00185580	2964 PSI	D.Grey	44	50.00	Eva Dynam	ic			
17	Prod_00185581	2964 PSI	D.Grey	45	50.00	Eva Dynam	ic			
18	Prod_00185582	2964 PSI	D.Grey	46	28.00	Eva Dynam	ic			
19	Total Pairs									
20	Prod_00185583	2964 PSI	D.Grey	39	6.00	Eva Dynam	ic			
21	Prod_00185584	2964 PSI	D.Grey	40	48.00	Eva Dynam	ic			
22	Prod_00185585	2964 PSI	D.Grey	41	80.00	Eva Dynam	ic			
23	Prod_00185586	2964 PSI	D.Grey	42	110.00	Eva Dynam	ic			
24	Prod_00185587	2964 PSI	D.Grey	43	108.00	Eva Dynam	ic			
25	Prod_00185588	2964 PSI	D.Grey	44	50.00	Eva Dynam	ic			
26	Prod_00185589	2964 PSI	D.Grey	45	50.00	Eva Dynam	ic			
27	Prod_00185590	2964 PSI	D.Grey	46	28.00	Eva Dynam	ic			
28	Total Pairs									

Fig.6.Result of above given code

Transfer Data from 'Raw Data' Worksheet to Sale Order Detail

By the help of macro presented below, the data is transferred from 'Raw Data' worksheet to 'Sale Order Detail' worksheet cell by cell. This whole process is performed by the help of for loop executed for as much times as much there are non-empty cells in the first column. Non-empty rows are counted by the help of rowscount variable; and in order paste in the 'Sale Order Detail' worksheet, variable i.e. row is taken with the value of 6. For loop starts pasting the data from 'Raw Data' worksheet (From A1) in 'Sale Order Detail' form 6<sup>th</sup> row (see fig.7).

```
Dim row As Long

Dim rowscount As Long

rowscount = Worksheets("Raw Data").Cells(rows.Count, 1).End(xlUp).row

row = 6

Worksheets("Sale Order Detail").Select

For i = 1 Torowscount

With Worksheets("Sale Order Detail")

.Cells(row, 1).Value = Worksheets("Raw Data").Cells(i, 1)

.Cells(row, 2).Value = Worksheets("Raw Data").Cells(i, 2)

.Cells(row, 3).Value = Worksheets("Raw Data").Cells(i, 3)

.Cells(row, 4).Value = Worksheets("Raw Data").Cells(i, 4)

.Cells(row, 5).Value = Worksheets("Raw Data").Cells(i, 5)

.Cells(row, 6).Value = Worksheets("Raw Data").Cells(i, 6)

End With

row = row + 1
```

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308	http://www.ijbems.com	ISSN:2941-9638

Vol.3. Issue 1. 2021 (March)

#### Next

A	В	C	D	E	F	G	н	I	к
	Plan	Detail 9	Sale O	rder No	SO#1234567			SPL/PLA/FRM/07 Rev: 01	
	i iaii	Bottan		ruor no	0011204001			Planning	
		Pro	duction	Planned O	rder				
Export Order	CSI				Total 12938 + 0 Sub	Pairs	8	Date: 02/26/2020	
Production	ltem number	Color	Size	Quantity	Sole	Start Date	End Date	Refrance Number	
Prod_00185567	2964 PSI	D.Grey	39	6	Eva Dynamic				
Prod_00185568	2964 PSI	D.Grey	40	48	Eva Dynamic		2		
Prod_00185569	2964 PSI	D.Grey	41	80	Eva Dynamic		÷		
Prod_00185570	2964 PSI	D.Grey	42	110	Eva Dynamic				
Prod_00185571	2964 PSI	D.Grey	43	108	Eva Dynamic				
Prod_00185572	2964 PSI	D.Grey	44	50	Eva Dynamic				
Prod_00185573	2964 PSI	D.Grey	45	50	Eva Dynamic				
Prod_00185574	2964 PSI	D.Grey	46	28	Eva Dynamic				
Total Pairs									
Prod_00185575	2964 PSI	D.Grey	39	6	Eva Dynamic				
Prod_00185576	2964 PSI	D.Grey	40	48	Eva Dynamic				
Prod_00185577	2964 PSI	D.Grey	41	80	Eva Dynamic				
Prod_00185578	2964 PSI	D.Grey	42	110	Eva Dynamic				
Prod_00185579	2964 PSI	D.Grey	43	108	Eva Dynamic				
Prod_00185580	2964 PSI	D.Grey	44	50	Eva Dynamic				
Prod_00185581	2964 PSI	D.Grey	45	50	Eva Dynamic		6		
Prod_00185582	2964 PSI	D.Grey	46	28	Eva Dynamic				
Total Pairs									
Prod_00185583	2964 PSI	D.Grey	39	6	Eva Dynamic				

Fig.7.Result of above given code

Print Row Number of 'Rows' Worksheet

In order to put the totals of assortments, it was necessary to define the row number (from where each assortment starts) of each assortment. By the of code of below given macro, the headings i.e. 'Total Pairs' is made bold and on the same time, number of that row is pasted in 'Rows' worksheet (see fig.8). In fig. 7, it can be seen that first heading i.e. 'Total Pairs' is contained by 15<sup>th</sup> row as pasted in 'Rows' worksheet, which can be seen in the fig.8.

```
Dim row As Long

Dim rowscount As Long

rowscount = Worksheets("Sale Order Detail").Cells(rows.Count, 1).End(xlUp).row

row = 1

For i = 7 Torowscount

If Worksheets("Sale Order Detail").Cells(i, 1).Value = "Total Pairs" Then

With Worksheets("Sale Order Detail")

.Cells(i, 1).Font.Bold = True

End With

Worksheets("Rows").Cells(row, 1).Value = Worksheets("Sale Order Detail").Cells(i, 1)

Worksheets("Rows").Cells(row, 2).Value = i

row = row + 1
```

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308	http://www.ijbems.com	ISSN:2941-9638	

Vol.3. Issue 1. 2021 (March)

1	A	В	С	D	E	F
1	Total Pairs	15				
2	Total Pairs	24				
3	Total Pairs	33				
4	Total Pairs	42				
5	Total Pairs	51				
6	Total Pairs	60				
7	Total Pairs	69				
8	Total Pairs	78				
9	Total Pairs	87				
10	Total Pairs	96				
11	Total Pairs	105				
12	Total Pairs	114				
13	Total Pairs	123			li),	

Fig.8.Result of above given code

Put Totals Below Each Assortment

In the macro as presented in the below given code, two variables i.e. rownum and rowsum are used to define the range for putting sum of total pairs of each assortment. Variable i.e. rownum contains the value present in the rowsum cell of second column in the 'Rows' worksheet. The value stored in rownum variable is stored in another variable called 'row' after the first execution of for loop with the increment of 1; on the same time, the value of rowsum variable is increased by one after the first execution of for loop. Since, the value of rowsum is increased by one then the value of rownum will automatically change. This cycle repeats itself as much as the number of rows in the first column of the 'Sale Order worksheet'.

Dim row As Long Dim rowscount As Long Dim rownum As Long Dim rowsum As Long On Error Resume Next Dim rowscountrows As Integer Dim RowsSaleOrderDetailAs Integer rowscount = Worksheets("Sale Order Detail").Cells(rows.Count, 1).End(xlUp).row 'MsgBox (rowscount) row = 7 rowsum = 1 For i = 1 Torowscount rownum = Worksheets("Rows").Cells(rowsum, 2).Value If Worksheets("Sale Order Detail").Cells(i, 1).Value = "Total Pairs" Then

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308	http://www.ijbems.com	ISSN:2941-9638

With Worksheets("Sale Order Detail") .Cells(i,5).Value=Application.WorksheetFunction.Sum(Worksheets("Sale OrderDetail").Range(Cells(row, 5), Cells(rownum - 1, 5))) .Cells(i, 5).Font.Bold = TrueWorksheets("Rows").Cells(rowsum, 3) = Worksheets("Sale Order Detail").Cells(i, 5).Value End With row = rownum + 1rowsum = rowsum + 1End If Next With Worksheets("Sale Order Detail") .Cells(rowscount, 5).Value = Application.WorksheetFunction.SumIf(Worksheets("Sale Order "Total Detail").Range("A7:A10485"), Pairs", Worksheets("Sale Order Detail").Range("E7:E10485")) .Cells(rowscount, 5).Font.Bold = True .Cells(rowscount, 1).Font.Bold = True .Range(Cells(7, 1), Cells(rowscount, 9)).RowHeight = 25 End With

	А	В	с	D	E	F	G	н	1		
1									SPL/PLA/FRM/07		
2		Plan	Detail	sale O	rder No.	50#1234567			Rev: 01		
3	<u>.</u>		Pro	duction	Planned O	rder			Planning		
5	Export Order	CSI	110		Date: 02/26/2020						
6	Production	Item number	Color	Size	Quantity	Sole	Start Date	End Date	Refrance Number		
7	Prod_00185567	2964 PSI	D.Grey	39	6	Eva Dynamic					
8	Prod_00185568	2964 PSI	D.Grey	40	48	Eva Dynamic					
9	Prod_00185569	2964 PSI	D.Grey	41	80	Eva Dynamic					
10	Prod_00185570	2964 PSI	D.Grey	42	110	Eva Dynamic					
11	Prod_00185571	2964 PSI	D.Grey	43	108	Eva Dynamic					
12	Prod_00185572	2964 PSI	D.Grey	44	50	Eva Dynamic					
13	Prod_00185573	2964 PSI	D.Grey	45	50	Eva Dynamic		-	-		
14	Prod_00185574	2964 PSI	D.Grey	46	28	Eva Dynamic					
15	Total Pairs				480						
16	Prod_00185575	2964 PSI	D.Grey	39	6	Eva Dynamic					
17	Prod_00185576	2964 PSI	D.Grey	40	48	Eva Dynamic					
18	Prod_00185577	2964 PSI	D.Grey	41	80	Eva Dynamic		-			
19	Prod_00185578	2964 PSI	D.Grey	42	110	Eva Dynamic					
20	Prod_00185579	2964 PSI	D.Grey	43	108	Eva Dynamic		-			
21	Prod_00185580	2964 PSI	D.Grey	44	50	Eva Dynamic		e			
22	Prod_00185581	2964 PSI	D.Grey	45	50	Eva Dynamic					
23	Prod_00185582	2964 PSI	D.Grey	46	28	Eva Dynamic					
24	Total Pairs				480						
25	Prod_00185583	2964 PSI	D.Grey	39	6	Eva Dynamic					
	Rav	v Data Sale Or	der Detail	Rows	÷						

#### INTERNATIONAL JOURNAL OF BUSINESS EDUCATION AND MANAGEMENT STUDIES (IJBEMS) A Peer Reviewed (Refereed) International Journal

A reel keviewed (keleleed) memanonal joomal											
Impact Factor 4.308	http://www.ijbems.com	ISSN:2941-9638									

Fig.9.Result of above given code

By the help of loop, the total pairs of each of the assortment are put against the row number in the 'Rows Worksheet' which can be seen in the fig.10. The font of headings (Total Pairs and Grand Total) is made bold at the end and the height of the rows in 'Sale Order Detail' worksheet is increased to 25 as shown in the fig.9.

	A	В	с	D	E	F
1	Total Pairs	15	480			
2	Total Pairs	24	480			
3	Total Pairs	33	480			
4	Total Pairs	42	352			
5	Total Pairs	51	38			
6	Total Pairs	60	480			
7	Total Pairs	69	480			
8	Total Pairs	78	480			
9	Total Pairs	87	476			
10	Total Pairs	96	38			
11	Total Pairs	105	480			
12	Total Pairs	114	480			
13	Total Pairs	123	480			
	4 F.	Raw Data	Sale O	rder Detail	Rows	e

Fig.10.Result of above given code in the 'Rows' worksheet

#### Insert SO Number and Date

After putting the totals below each assortment, the sale order number is put the 9<sup>th</sup> column of the 'Sale order Detail; worksheet. On the empty textbox, the message for filling the textbox is received as shown in the fig.11.

```
If UserForm1.TextBox1.Text = "" Then

MsgBox "Please Insert SO#", vbCritical

Else

rowscount = Worksheets("Sale Order Detail").Cells(rows.Count, 1).End(xlUp).row

For i = 7 Torowscount

If Worksheets("Sale Order Detail").Cells(i, 1).Value = "Total Pairs" Or Worksheets("Sale

Order Detail").Cells(i, 1).Value = "Grand Total" Then

With Worksheets("Sale Order Detail")

.Cells(i, 9).Value = ""

End With

Else

With Worksheets("Sale Order Detail")

.Cells(i, 9).Value = UserForm1.TextBox1.Text

End With
```

A Peer Reviewed (Refereed) International Journal

	End If																		
N	Jext																		
F	End If																		
П																			
Ρ	ut Date																_	_	
	File Home Insert					Table Tools Design Q Tell me w												- 0 8	Share
I	Copy -	libri • 11 •	A* A* =	= %-	🔐 Wrap Text	Text -		Normal	Bad Go	od	Neutral	Calculat	ion +	<b>* *</b>	Σ	AutoSum * A Fill * 2	₹ <b>₽</b>		
Pa	Format Painter     Clipboard	I U +   🖽 +   💆 Font	•• 🔺 • 📰	Aligne	Merge & Center	( × \$ × % ≯ 5.8 43 G Number G	Formatting * Table	e *	Explanatory In Styles	put		Note	v	Cells	- Format	Clear * Fi Editing	iter = Select =		~
F8	8 * : ×	🗸 – 🖍 🛛 Eva Dyn	amic																×
1	A	В	С	D	E	F	G	н	I SPL/PLA/FRM/07	. к	L	М	N	0	Р	Q	R	S	-
2	2	P	lan Deta	ail Sale	e Order I	No. asdfas			Rev: 01										
4	•		Pro	duction	Planned O	rder	sil Commands Menu				×								
5	Export Order	CS	1			Total 129													
6	Production	Item number	Color	Size	Quantity	s		1.00	D. L.		_								
7	Prod_00185567	2964 PSI	D.Grey	39	6	Eva D		ASU	1.0		-								
8	Prod_00185568	2964 PSI	D.Grey	40	48	Eva D	400	Microsoft Excel	× ASOD 3.0		-								
9	Prod_00185570	2964 PSI	D.Grey	41	110	Eva D	Apu	Please In	sert SD#		1								
10	Prod 00185571	2964 PSI	D.Grey	43	108	Eva D			ОК		-								
11	Prod 00185572	2964 PSI	D.Grey	44	50	Eva D	Organize SOD		Final Result										
12	Prod_00185573	2964 PSI	D.Grey	45	50	Eva D	-	Close											
14	Prod_00185574	2964 PSI	D.Grey	46	28	Eva D		Developed in (	Oct, 2019										
15	5 Total Pairs				480														
16	6 Prod_00185575	2964 PSI	D.Grey	39	6	Eva Dynamic			asdfas										
17	7 Prod_00185576	2964 PSI	D.Grey	40	48	Eva Dynamic			asdfas										
18	B Prod_00185577	2964 PSI	D.Grey	41	80	Eva Dynamic			asdfas										
19	9 Prod_00185578	2964 PSI	D.Grey	42	110	Eva Dynamic			asdfas										
	Raw Data	Sale Order Detail	Rows (+	)	109	Eus Dunamia	1	1	andfan	1			I						P C C C C C C C C C C C C C C C C C C C
Rea	aut III																		

Fig.11.Result of above given code

By using the code given below, date is put into the cell 'I5' which can be seen in the fig.12 below.

Worksheets("Sale Order Detail").Range("I5").Value = "Date: " & Format(Now(), "mm/dd/yyyy")

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308

http://www.ijbems.com ISSN:2941-9638

Vol.3. Issue 1. 2021 (March)

	A	В	С	D	E	F	G	н	and all services		
									SPL/PLA/FRM/07		
			Plan L	Jetail	Sale Ord	er No.			Rev: 01		
	-		Dec	duction	Dianned Or	dar			Planning		
	Export Order	CSI	PIC	auction	Planned Or	uer			Date: 04/02/202		
	Production	Item number	Color Size	Quantity	Sole	Start Date	End Date	Refrance Numbe			
	Prod_00185567	2964 PSI	D.Grey	39	6	Eva Dynamic	Eva Dynamic		SO#1234567		
	Prod_00185568	2964 PSI	D.Grey	40	48	Eva Dynamic			SO#1234567		
	Prod_00185569	2964 PSI	D.Grey	41	80	Eva Dynamic			SO#1234567		
)	Prod_00185570	2964 PSI D.Grey		od_00185570 2964 PSI D.Grey 42 110 Eva Dynamic				SO#1234567			
	Prod_00185571	2964 PSI	D.Grey	43	108	Eva Dynamic			SO#1234567		
2	Prod_00185572	2964 PSI	D.Grey	44	50	Eva Dynamic			SO#1234567		
3	Prod_00185573	2964 PSI	D.Grey	45	50	Eva Dynamic			SO#1234567		
1	Prod_00185574	2964 PSI	D.Grey	46	28	Eva Dynamic			SO#1234567		
5	Total Pairs				480						
5	Prod_00185575	2964 PSI	D.Grey	39	6	Eva Dynamic			SO#1234567		
,	Prod_00185576	2964 PSI	D.Grey	40	48	Eva Dynamic			SO#1234567		
3	Prod_00185577	2964 PSI	D.Grey	41	80	Eva Dynamic			SO#1234567		
	Prod_00185578	2964 PSI	D.Grey	42	110	Eva Dynamic			SO#1234567		
	Dead 00100070		D.Crou	12	100	Fuo Dunamia			CO#1004EC7		

Fig.12.Result of above given code

Put Total Plan Pairs and Sub Plan Pairs

After all tasks discussed earlier, total plan pairs and sub plan pairs are put into the merged cells i.e. D5:H5 (see fig.13).

```
rowscount = Worksheets("Rows").Cells(rows.Count, 1).End(xlUp).row
  For i = 1 Torowscount
    If Worksheets("Rows").Cells(i, 3).Value <= 20 Then
Worksheets("Rows").Cells(i, 4).Value = Worksheets("Rows").Cells(i, 3).Value
Worksheets("Rows").Cells(i, 3).Value = ""
    Else
Worksheets("Rows").Cells(i, 4).Value = ""
    End If
  Next
PlanPairs = Application.WorksheetFunction.SumIf(Worksheets("Rows").Range("A1:A10485"),
"Total Pairs", Worksheets("Rows").Range("C1:C10485"))
SubPlanPairs
                                                                                         =
Application.WorksheetFunction.SumIf(Worksheets("Rows").Range("A1:A10485"),
                                                                                    "Total
Pairs", Worksheets("Rows").Range("D1:D10485"))
With Worksheets("Sale Order Detail")
  .Select
  .Range("D5").Value = "Total " &PlanPairs& " + " &SubPlanPairs& " Sub Pairs"
  .Range("A1").Value = "Plan Detail Sale Order No. " & UserForm1.TextBox1.Text
End With
```

A Peer Reviewed (Refe	reed) International Journal	
Impact Factor 4.308	http://www.ijbems.com	ISSN:2941-9638

Vol.3. Issue 1. 2021 (March)

Criteria for plan pairs is defined earlier in the code given just above; the number of pairs > 20 are recognized as the plan pairs and number of pairs < 20 are defined as the sub plan pairs. therefore, sub plan pairs are copied from third column of 'Rows' worksheet to 4<sup>th</sup> column of the active worksheet; on the same, sub plan pairs are deleted from 3<sup>rd</sup> column of the active worksheet.

	А	В	С	D	E	F	G	н	L I
1									SPL/PLA/FRM/07
2			Plan E	Detail S	Sale Ord	ler No.			Rev: 01
3									Planning
4			Pro	duction	Planned O	rder			
5	Export Order	CSI				Total 12938 + 0 Sub	Pairs		Date: 04/02/2020
6	Production	Item number	Color	Size	Quantity	Sole	Start Date	End Date	Refrance Number
7	Prod_00185567	2964 PSI	D.Grey	39	6	Eva Dynamic			SO#1234567
8	Prod_00185568	2964 PSI	D.Grey	40	48	Eva Dynamic			SO#1234567
9	Prod_00185569	2964 PSI	D.Grey	41	80	Eva Dynamic			SO#1234567
10	Prod_00185570	2964 PSI	D.Grey	42	110	Eva Dynamic			SO#1234567
11	Prod_00185571	2964 PSI	D.Grey	43	108	Eva Dynamic			SO#1234567
12	Prod_00185572	2964 PSI	D.Grey	44	50	Eva Dynamic			SO#1234567
13	Prod_00185573	2964 PSI	D.Grey	45	50	Eva Dynamic			SO#1234567
14	Prod_00185574	2964 PSI	D.Grey	46	28	Eva Dynamic			SO#1234567
15	Total Pairs				480				
16	Prod_00185575	2964 PSI	D.Grey	39	6	Eva Dynamic			SO#1234567
17	Prod_00185576	2964 PSI	D.Grey	40	48	Eva Dynamic			SO#1234567
18	Prod_00185577	2964 PSI	D.Grey	41	80	Eva Dynamic			SO#1234567
19	Prod_00185578	2964 PSI	D.Grey	42	110	Eva Dynamic			SO#1234567
	Dead 0010EE 70	2004 001	DCrow	42	100	Fue Dunamia			CO#1024EC7

Fig.13.Result of above given code

Time Consumed by New Method

Similar to the old method of preparing SOD, time study of various automated tasks performed in ASOD 1.0 was conducted (see table 2).

Notations

i=Press Ctrl + Q and Form Appears j=Execution time of Command Button 'Organize SOD' k=Write SO# into the textbox l=Execution time of Command Button 'Organize SOD' m=Close Form Table 2. Time study of suggested method

	Obs.	Mean									
Activity	1	2	3	4	5	6	7	8	9	10	Time
	(sec)										
а	59.28	44.44	52.44	55.7	47.23	42.13	48.34	42.62	43.61	62.36	49.82
i	1.27	1.23	1.51	1.87	1.25	1.36	1.15	1.81	1.45	1.4	1.43
j	2.44	1.8	1.4	2.83	2.22	1.76	3.07	2.15	1.16	2.11	2.094
k	4.3	4.49	4.64	3.7	4.25	4.08	5.02	4.53	4.28	4.43	4.372

A Peer Reviewed (Refereed) International Journal Impact Factor 4.308 http://www.ijbems.com Vol.3. Issue 1. 2021 (March)

1	5.25	5.52	5.63	5.19	5.71	5.65	5.81	5.28	5.11	5.07	5.422
m	1.28	0.94	1.12	0.97	1.26	1.13	0.8	1.18	1.04	1.08	1.08

ISSN:2941-9638

T = a + i + j + k + l + m

T = 64.213 sec

Total time consumed by ASOD 1.0 for preparing the sale order detail as calculated by the formula.

T= 1.07 min

## **COMPARISON OF BOTH METHODS**

Old method used to take 6.87 min for preparing the sale order detail whereas, ASOD 1.0 took 1.07 min. comparison of both methods indicated that new method took 84.42% less time and the accuracy of the new method was 100% if the basic data is accurate.

### DISCUSSIONS

For making reports on daily, monthly, quarterly bi-annually and yearly basis every small and medium enterprise (SME) hires employees. In MS excel Most of the report in mentioned sector is conducted. MS excel takes large amount of time manually in the case of complex reporting and at the meantime, there is the extra chance of error as well. Microsoft has thus already kept the flexibility of customized automation in its application such as Word, Excel, PowerPoint and Project by Visual basic for applications (VBA) especially for this problem. Visual basic editor (VBE) conducts the work on VBA. Therefore, Microsoft has already developed the technologies i.e. VBA, VSTO, ActiveX and etc. [4][19]. In Microsoft windows, VBA technology is provided on the platform of many software [20][3][21]. Currently, companies, employees are promoted for gaining the skills and knowledge of using excel and VBA [22]. When it is about VBA, then it is about the customization and development in integrated development environment (IDE) in the applications of MS office for the automation and simplification of manual, complex and repeated work [4][15][23][21][20].Basically it is known for automating the routine work in existing office productivity applications [4][22]. Objective of the recently research was to automate the material delivery time report analysis. Whenever the employees used to forget the steps of making the report and due to that error were greater. This report was used to be prepared at the case company once in a month and in the meantime. A large Number of VBA in excel were programmed to implement those commands which were once done manually in excel. All those macros used to be run on the single click. When the input from user is to be taken userforms are used [15]. A code is required to run the operations automatically [15][21][17]. If literature is traced back and the prevalence of same research is found. As VBA was used by Bartoszewicz and Wdowicz (2019) in order to recreate and execute the process for migration of data and its analysis; was quite faster, flexible and the way to speed the complex analytical report formation; comparison of old and new method revealed, and as usual time of report was reduced form 2 hours to 5 minutes [24]. By the usage of excel VBA Cirujano and Zhu (2013) worked on the manpower resource planning report; an experienced employee had to work for 30 working hours to make the report but after the automation by VBA, it takes 10 minutes [7]. In the same way

A Peer Reviewed (Refereed) International Journal

Impact Factor 4.308 <u>http://www.ijbems.com</u> ISSN:2941-9638

through VBA in excel Kalwar and Khan (2020) automated the provision report at the planning and costing department of the company through which 75% of the employee's time was saved [17] New method takes 1.55 minutes to complete the report whereas Old method of preparing the material delivery analysis report used to take 5.324 minutes. So if we compare both methods it is clear that the new method takes 70.86% less time as compared to the old method. Because of automated operation, there would be no chance or error in the report if the basic data is 100% accurate, so it is obvious that new method is more efficient and effective. A mechanism of generating bill of material of transmission line by using VBA was developed by Yan and Wan (2017) ; efficiency and accuracy of calculation are tremendously reduced; at the same time, errors in the calculation process of steel BOMs were improved [16].Another researcher Abidin et al., (2013) also calculated API and WQI in the automated way; they reported that calculation time and errors were reduced by automating the calculations in the Microsoft excel VBA [1].

## CONCLUSION

Repeated manual operation leads to mental fatigue and it includes the greater chance of human error; therefore, in order to save employees from quick mental fatigue, one of the report i.e. sale order detail report was automated with visual basic for applications in excel. Time consumption both (old and new method) methods were calculated and the comparison showed that new method takes 84.42% less time than old method. Furthermore, the most important benefit of this automation is that there is no need to recheck the report (which is prepared by new method) for mistakes.

## **FUTURE IMPLICATIONS**

Since, automation in excel reporting is not the permanent solution when there is the usage of Microsoft Dynamics AX 2012 in the company. Automation in excel is a good solution but it is not counted for the long run. Therefore, it was suggested to the company for the incorporation of the report into Microsoft Dynamics AX 2012.

## ACKNOWLEDGEMENT

Authors of this research paper would like to thank the employee of the planning and costing department who cooperated in making them learn the report and gave proper feedback to brings its accuracy.

#### **CONFLICT OF INTEREST**

Among the authors of the present paper, there was no conflict of interest.

## REFERENCES

- I. Z. Abidin, H. Juahir, A. Azid, A. D. Mustafa, and F. Azaman, "Application of Excel-VBA for computation of water quality index and air pollutant index," *Malaysian J. Anal. Sci.*, vol. 19, no. 5, pp. 1056–1064, 2015.
- [2] M. Bernard, E. Dwi Minarti, and M. Hutajulu, "Constructing Student's Mathematical Understanding Skills and Self Confidence: Math Game with Visual Basic Application for

Microsoft Excel in Learning Phytagoras at Junior High School," *Int. J. Eng. Technol.*, vol. 7, no. 3.2, pp. 732–736, 2018, doi: 10.14419/ijet.v7i3.2.18738.

- [3] T. Norton and B. Tiwari, "Aiding the understanding of novel freezing technology through numerical modelling with visual basic for applications (VBA)," *Comput. Appl. Eng. Educ.*, vol. 21, no. 3, pp. 530–538, 2013, doi: 10.1002/cae.20498.
- [4] H.-L. DING, K.-Y. QI, X.-L. ZHAO, and G.-F. XU, "Tibetan Typographical Specifications and Technical Realization Based on Word VBA," in *4th International Conference on Advanced Education and Management*, 2017, pp. 407–412, doi: 10.12783/dtssehs/icaem2017/19117.
- [5] P. J. Blayney and Z. Sun, "Using Excel and Excel VBA for Preliminary Analysis in Big Data Research," in *Managerial Perspectives on Intelligent Big Data Analytics*. *IGI Global*, no. March, 2019, pp. 110–136.
- [6] R. Abraham and M. Corporation, "Spreadsheet Programming," *Wiley Encyclopedia of Computer Science and Engineering*. 2008.
- [7] J. Cirujano and Z. Zhu, "Automatic reporting for manpower resources," *Proceedings, Annu. Conf. Can. Soc. Civ. Eng.*, vol. 1, no. January, pp. 710–719, 2013.
- [8] M. A. Kalwar, M. A. Khan, S. A. Shaikh, A. Salam, M. S. Memon, and S. A. Khaskheli, "Aggressive Driving Behavior: A Case Study of Mehran UET," in *Proceedings of the International Conference on Industrial Engineering and Operations Management Dubai*, 2020, pp. 2350–2359, [Online]. Available: http://www.ieomsociety.org/ieom2020/papers/175.pdf.
- [9] S. A. Khaskheli, M. A. Kalwar, A. A. Siddiqui, M. A. K. Nagar, and T. H. Wadho, "Impatience Among Drivers With Varying Demographics," in *Professional Trends in Industrial and Systems Engineering*, 2018, pp. 465–469.
- A. Ahmadi, P. H. Robinson, F. Elizondo, and P. Chilibroste, "Implementation of CTR [10] dairy model using the visual basic for application language of Microsoft excel," Int. J. Agric. Environ. vol. 9. Inf. Svst., no. 3. pp. 74-86. 2018, doi: 10.4018/IJAEIS.2018070105.
- [11] A. Belchior Junior *et al.*, "Development of a Vba Macro-Based Spreadsheet Application for Relap5 Data Post-Processing," in *International Nuclear Atlantic Conference*, 2011, pp. 978–85.
- [12] R. Hila, "Water Quality Data Management Database," 2009.
- [13] K. SATO and R. YOKOYAMA, "Teaching Aid for Remote Sensing and Map Imagery Analysis Using Excel Spreadsheet and VBA," 2001, [Online]. Available: http://www.crisp.nus.edu.sg/~acrs2001/pdf/015venka.pdf.
- [14] J. Daniel et al., "Mathematical Model and Programming in VBA Excel for Package

Calculation," Int. J. Eng. Res. Appl., vol. 6, no. 5, pp. 55–61, 2016.

- [15] H. T. Evensen, "A versatile platform for programming and data acquisition: Excel and Visual Basic for Applications," 2014.
- [16] Q. Yan and Y. Wan, "Using the special font and VBA program to make bill of materials in the transmission line engineering," *Rev. la Fac. Ing.*, vol. 32, no. 2, pp. 335–341, 2017.
- [17] M. A. Kalwar and M. A. Khan, "Optimization of Procurement & Purchase Order Process in Foot Wear Industry by Using VBA in Ms Excel," *Int. J. Bus. Educ. Manag. Stud.*, vol. 5, no. 2, pp. 80–100, 2020, [Online]. Available: https://www.ijbems.com/doc/IJBEMS-124.pdf.
- [18] A. Mustafa and A. Hatemi-J, "A VBA module simulation for finding optimal lag order in time series models and its use on teaching financial data computation," *Appl. Comput. Informatics*, 2020, doi: 10.1016/j.aci.2019.04.003.
- [19] D. Porter and R. Stretcher, "Automating Markowitz Optimizations Using VBA," J. Instr. *Tech. Financ.*, vol. 4, no. 1, pp. 9–16, 2012.
- [20] S. Kuka and B. Karamani, "Using Excel and VBA for Excel to Learn Numerical Methods," in *1st International Sympsosium on Computing in Informatics and Mathematics*, 2011, pp. 365–376.
- [21] M. I. P. Harahap and M. H. Azmi, "Development of Excel Vba Program for Small Drainage Network," *E-Academia J.*, vol. 6, no. 1, pp. 216–227, 2017.
- [22] S. CHATVICHIENCHA, "Enhancing Computational Thinking by Excel-VBA Based Problem Solving," in *The 2nd International Conference on Innovation in Education*, 2015, pp. 284–290, [Online]. Available: http://www.il.mahidol.ac.th/icie2015/images/ICIE2015 Conference Proceeding-Final.pdf.
- [23] C. F. Minto, *PKPD Tools for Excel.* 2009.
- [24] G. Bartoszewicz and M. Wdowicz, "Automation of the Process of Reporting the Compliance of the Production Plan with Its Execution Based on Integration of SAP ERP System In Connection With Excel Spreadsheet and VBA Application," in *Digitalization of Supply Chains*, 2019, pp. 101–116.