



# Improving the Efficiency of Small Management Information System by Using VBA

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**Abstract-Purpose:** This research is the case study of small management information system at the Civil Aviation authority (CAA) Logistic center south, Karachi. In local purchase department demand management system (DMS) was already designed in MS excel; because of the manual operation it was time consuming job for the operator to organize, manage and retrieve the data in the system. The purpose was to initiate the user-friendly platform for the data organization, storage and retrieval in order to save the efforts and time of the employee. The data management system was modified by the help of visual basic for applications (VBA) excel. The code was compiled and executed in Visual basic editor (VBE). Command buttons in each of the sheets were inserted so that the code could be executed on click. The data was supposed to be copied manually from one spreadsheet to another for keeping alike data. Therefore, the existing system was required to be modified so that the time of operator could be saved. The data management system was modified by the help of visual basic for applications (VBA) excel. The retrieval time of the old and new DMS was collected by the help of stop watch and their comparison indicated that the new DMS was less time consuming in terms of data organization, management and retrieval. 50% of the employee's time was minimized by the initiation of DMS. Small repetitive computerized tasks lead an employee to frustration and irritation which finally result in dampening moral of the employees; in order to save the employees from that frustration, the DMS was necessary to be initiated. Since, excel spreadsheet with VBA code is not the permanent solution; the same characteristic/feature can be embedded in the oracle enterprise resource planning (ERP) software which was already implemented there. VBA excel as the small characteristics of MS excel and excel workbook can get corrupted easily so it was not a permanent solution to the problem.

**Keywords-** Efficiency, Data Management, Excel, Visual Basic for Applications

## I. 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, lowers the formulae burden and secures the worksheets. The facility of VBA is being facilitated to many other applications 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]. This research is the case study of small management information system at the Civil Aviation authority (CAA) Logistic center south, Karachi. In local purchase department demand management system (DMS) was already designed in MS excel; because of the manual operation it was time consuming job for the operator to organize, manage and retrieve the data in the system. The purpose was to initiate the user-friendly platform for the data organization, storage and retrieval in order to save the efforts and time of the employee.

## II. LITERATURE REVIEW

With advent of technology, companies needs to change their processes in order to increase the productivity and efficiency [8]–[12]. 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. Zainal Abidin 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 [13]–[16]. 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 [17]. 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 [18]. 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) [19]. 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 [20]. 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 [21]. Moreover through Visual Basic for Application H. Evenson (2014) execute instrument communication in excel for the very first time in 2014 [22]. 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 [19]. Through VBA mapping rules were created by Wettlaufer (2010). One macro was programmed for each report. In 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 [19]. 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 contain 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) [21]. 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) [22]. 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 [23]. Provision report and purchase order report ere automated through a research observed 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 [8]. 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 [24]. Queue is common occurrence in daily life [25]–[27].

### III. 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 has been conducted in the context of data organization, management and retrieval; in this regard, present study was conducted in which the demand management system at the small level was initiated.

### IV. NEED FOR AUTOMATION

Small repetitive computerized tasks lead an employee to frustration and irritation which finally result in dampening moral of the employees; in order to save the employees from that frustration, the DMS was necessary to be initiated.

### V. RESEARCH METHODOLOGY

This research is a case study which describes the improvement that was brought in the demand management

system at civil aviation authority, south center Karachi. The manual Excel spreadsheet was already there for entering, organizing and retrieval of demands coming from the different airports across Pakistan. Present sheet was manually operated; thus it was time consuming job to organize and retrieve data. The spreadsheet was automated by using the command buttons, textboxes; visual basic for applications (VBA) was coded behind the command buttons. By the use of VBA, the manual operation was automated which led to the well organization and quick retrieval of data.

## VI. RESULTS

In the early days of implementation of central database of enterprise resource planning, it was not fully integrated with all the excel worksheets thus, it was time consuming job to manage the workbook. This was the reason, demands` data was used to be stored into the excel file.

### A. The old demand management system

Old demand management system was already there; which was made by one of the personnel of Civil

S. NO.	DEMAND NO.	STATION	DATE	REF NO.	SHORT DESCRIPTION
4	A/01	GED (S)	4-Jul-14	M-071-0014	WATER BODY ASSY REQ FOR GA-4349 LC (S)
5	A/02	GED (S)	4-Jul-14	M-071-0049	TIMING BEARING REQ FOR GA-4349
6	A/03	GED (S)	4-Jul-14	M-071-0017	TIMING BELT REQ FOR GA-4349 LC (S)
7	A/04	GED (S)	4-Jul-14	M-071-0021	AIR FILTER REQ FOR GA-4349 LC (S)
8	A/05	GED (S)	4-Jul-14	M-071-0001	OIL FILTER
9	A/06	GED (S)	4-Jul-14	M-071-0002	DIESEL FILTER (FUEL FILTER) REQ FOR GA-4349 LC (S)
10	A/07	GED (S)	4-Jul-14	M-071-0000	FAN BELT REQ FOR GA-4349 LC (S)
11	A/08	GED (S)	9-Jul-14	M-066-0331	SOLENOID VALVE FOR BUMPER TURRET # 0US45PY REQ FOR LCFT BARRACUDA L-15-B EX-NAWABSHAH
12	A/09	GED (S)	9-Jul-14	M-066-0881	CAP (TYRE FILLING NOZZLE) REQ FOR LCFT L-15-B EX-NAWABSHAH
13	A/10	GED (S)	9-Jul-14	M-066-0007	V-BELT A-83 FOR STEERING PUMP)
14	A/11	GED (S)	9-Jul-14	M-066-0236	V-BELT A-83 (FOR FAN)
15	A/12	GED (S)	9-Jul-14	M-066-0247	DELUGE PUMP ASSY 24V DC REQ FOR LCFT BARRACUDA L-15-B EX-NAWABSHAH
16	A/13	GED (S)	9-Jul-14	M-066-0764	SEARCH LIGHT (RECHARGEABLE) 24V DC WITH CHARGER
17	SK-01	SUKKUR	24-Jul-14	S-001-1579	CLEANING BLADE P/O PHOTOCOPIER
21	NH-16	NAWABSHAH	25-Jul-14	K-007-0166	OIL FILTER P NO LF-3356 P/O 250 KVA GENERATOR
22	QT-108	QUETTA	26-Jul-14	A-025-0042	AVR SVKVA SERVO TYPE MAKE STADOMTIC
23	GWD/66	GAWADAR	12-Jul-14	K-007-0701	OIL SENSOR OF 140 KVA GENERATOR
24	GWD/67	GAWADAR	12-Jul-14	K-007-0116	AMPERE METER FOR 75 KVA GENERATOR
25	GWD/68	GAWADAR	14-Jul-14	C-001-0036	48 AMP, 12 VOLT BATTERY FOR CAA VEHICLE NO GA-9042
26	GWD/69	GAWADAR	14-Jul-14	S-001-0141	JUICER MACHINE FOR MESS OF GAWADAR AIRPORT
27	GWD/70	GAWADAR	14-Jul-14	S-016-0153	JUICER MACHINE FOR MESS OF CAA RESIDENCE KITCHEN

Figure 1. Old Demand Management System

Aviation Authority (CAA). It was consisted of four worksheets named as: 'Data', 'LP Register', 'Issued', 'Calculations\_1' (see fig. 1).

The person who was responsible to process the demands to different sections in the center, he made his own excel file to maintain the records himself; in this way he could access the data easily. The very first input of the demand was entered in the worksheet named as 'Data'.

The user used to carry out his activities manually on excel and for the identification of demand's current stage in the process; thus, used to change the color of activities like as, when the demand was sent to the LP (local purchase); the color was used to be orange.

The user had made his own criteria to manage the demand's section in the Microsoft excel like as, giving the different colors to different activities in below given manner:

- **Green** was used for the demands which were processed and issued to the corresponding stations.

- **Orange** was used for the demands that were sent to local purchase (section of the department).
- **Blue** was used for the demands which were returned back to stations.
- **Black** was used for the demands that were not processed yet.

After the specific demand was processed h used to copy that demand and paste into another specific sheet.

### 1) Function of Different Worksheets

#### a) LP Register

This worksheet was made to paste in the demands which were processed to the local purchase (LP) section (see fig. 2).

DEMAND NO.	STATION	D. DATE	REFERENCE #	ITEM DESCRIPTION
EM125	GED (S)	8-Sep-14	F-001-0219	LUGS (4) PER SAMPLE REQ FOR GENERAL USE
EM126	GED (S)	8-Sep-14	F-002-0980	BATTERY TERMINAL (LARGE SIZE) COPPER MATERIAL REQ FOR GENERATOR BATTERIES
EM127	GED (S)	8-Sep-14	F-001-0073	LUGS (10) TYPE (4) PER SAMPLE REQ FOR GENERAL USE
EM128	GED (S)	8-Sep-14	F-005-0113	LUGS (4) PER SAMPLE REQ FOR GENERAL USE
EM129	GED (S)	8-Sep-14	F-001-0004	LUGS (10) TYPE (4) PER SAMPLE REQ FOR GENERAL USE
EM130	GED (S)	8-Sep-14	F-001-0088	LUGS (10) TYPE (4) PER SAMPLE REQ FOR GENERAL USE
EM131	GED (S)	8-Sep-14	F-001-0113	LUGS (10) TYPE BIG SIZE (4) PER SAMPLE REQ FOR DAY TO DAY USE
EM132	GED (S)	8-Sep-14	F-001-0112	LUGS (10) TYPE BIG SIZE SMALL SIZE (4) PER SAMPLE REQ FOR GENERAL USE
A/01	GED (S)	4-Jul-14	M-071-0014	WATER BODY ASSY REQ FOR GA-4349 LC (S)
A/02	GED (S)	4-Jul-14	M-071-0049	TIMING BEARING REQ FOR GA-4349
A/03	GED (S)	4-Jul-14	M-071-0017	TIMING BELT REQ FOR GA-4349 LC (S)
A/04	GED (S)	4-Jul-14	M-071-0021	AIR FILTER REQ FOR GA-4349 LC (S)
A/05	GED (S)	4-Jul-14	M-071-0001	OIL FILTER
A/06	GED (S)	4-Jul-14	M-071-0002	DIESEL FILTER (FUEL FILTER) REQ FOR GA-4349 LC (S)
A/07	GED (S)	4-Jul-14	M-071-0000	FAN BELT REQ FOR GA-4349 LC (S)

Figure 2. Local purchase register sheet

#### b) Issued sheet

The issued sheet was made to paste in the details of those demands; which were issued to the stations (see fig. 3).

STATION	D. DATE	REFERENCE #	ITEM DESCRIPTION
NAWABSHAH	30-Oct-14	H-004-0073	TRANSFER CASE OIL (FOR S-33-O)
NAWABSHAH	30-Oct-14	H-004-0070	DIFFERENTIAL / HUB OIL FOR OSHKOSH & BARRACUDA SHELL SPIRAX, 52-A-90 OR EQUIVALENT
NAWABSHAH	30-Oct-14	M-066-0112	POWER DIVIDER OIL (L-08-B)
NAWABSHAH	30-Oct-14	M-066-0112	POWER DIVIDER OIL (L-08-B)
NAWABSHAH	30-Oct-14	H-004-0070	AXIL HUB OIL (L-08-B)
NAWABSHAH	30-Oct-14	H-004-0070	AXIL HUB OIL (L-08-B)
NAWABSHAH	30-Oct-14	H-004-0073	MONITOR OIL (L-08-B)
NAWABSHAH	30-Oct-14	H-004-0073	MONITOR OIL (L-08-B)
NAWABSHAH	30-Oct-14	H-004-0073	ENGINE OIL (S-33-O)
NAWABSHAH	30-Oct-14	H-004-0073	ENGINE OIL (L-08-B)
NAWABSHAH	30-Oct-14	H-004-0073	GREASE FOR UNIVERSAL SELF JOINT (S-33-O)
NAWABSHAH	30-Oct-14	M-081-0014	FILTER FUEL PRIMARY OSHKOSH
NAWABSHAH	30-Oct-14	M-081-0015	FILTER FUEL SECONDARY OSHKOSH
NAWABSHAH	30-Oct-14	M-081-0021	FILTER ELEMENT POWER DIVIDER OSHKOSH
NAWABSHAH	30-Oct-14	M-081-0016	FILTER ENGINE COOLANT OSHKOSH
NAWABSHAH	30-Oct-14	M-081-0018	FILTER AIR DRIVER OSHKOSH
NAWABSHAH	30-Oct-14	M-066-0002	FILTER ENGINE OIL (L-08-B, L-09-B)
MOENJODAR	14-Oct-14	J-001-0066	1.5 TON WINDOW A/C UNIT (HAIR MAKE) (FOR COMMUNICATION SECTION

Figure 3. Issued worksheet

#### c) Calculations\_1 Sheet

The purpose of making this worksheet was to have the summary of all the demands which have been received, processed, issued, awaiting or returned back to the stations (see fig. 4).

DEMAND STATISTICS	2019	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY
TOTAL DEMANDS RECEIVED IN PAB	1019								
AUTHORITY WRITTEN & AWAITED	319	3-Jul-14	0	1-Sep-14	0	1-Nov-14	0	1-Jan-14	1-Feb-14
DEMANDS RETURNED TO LOCAL PURCHASE	101	2-Jul-14	0	2-Sep-14	0	2-Nov-14	0	2-Jan-14	2-Feb-14
DEMANDS PROCESSED & ISSUED	101	2-Jul-14	0	2-Sep-14	0	2-Nov-14	0	2-Jan-14	2-Feb-14
DEMANDS RETURNED BACK TO STATIONS	26	4-Jul-14	0	4-Sep-14	20	4-Nov-14	0	4-Jan-14	4-Feb-14
UNPROCESSED DEMANDS (NO ACCURATE INFO)	558	5-Jul-14	0	5-Sep-14	15	5-Nov-14	3	5-Jan-14	5-Feb-14
		8-Aug-14	6	8-Sep-14	0	8-Nov-14	77	8-Dec-14	8-Jan-14
		7-Jul-14	0	7-Sep-14	0	7-Nov-14	12	7-Dec-14	7-Jan-14
		8-Aug-14	24	8-Sep-14	1	8-Nov-14	0	8-Dec-14	8-Jan-14
		10-Jul-14	0	10-Sep-14	0	10-Nov-14	1	10-Dec-14	10-Jan-14
		11-Aug-14	33	11-Sep-14	3	11-Nov-14	0	11-Dec-14	11-Jan-14
		12-Jul-14	0	12-Sep-14	88	12-Nov-14	7	12-Dec-14	12-Jan-14
		13-Aug-14	13	13-Sep-14	0	13-Nov-14	11	13-Dec-14	13-Jan-14
		14-Jul-14	0	14-Sep-14	0	14-Nov-14	2	14-Dec-14	14-Jan-14
		15-Aug-14	15	15-Sep-14	21	15-Nov-14	0	15-Dec-14	15-Jan-14
		16-Jul-14	0	16-Sep-14	25	16-Nov-14	0	16-Dec-14	16-Jan-14
		17-Aug-14	0	17-Sep-14	11	17-Nov-14	0	17-Dec-14	17-Jan-14
		18-Jul-14	13	18-Sep-14	0	18-Nov-14	23	18-Dec-14	18-Jan-14
		19-Aug-14	0	19-Sep-14	0	19-Nov-14	0	19-Dec-14	19-Jan-14
percentage of demands processed	45.144138								

Figure 4. Overall counting summary worksheet

This also provided the total number of demands arrival in section, also the number of issued demands, the demands sent to the local purchase, unprocessed demands, demands return back to stations, and authority awaiting demands.

Since, this was the manually operated information system; therefore, it was highly required to improve the current system into automated one so that time and efforts could be minimized. The description of new demand management system (DMS) is given as under.

2) *New Demand Management System*

Suggested DMS was developed by using visual basic for applications (VBA); this is the built in feature in excel. Improved DMS was consisted of nine sheets which are described as under;

1. Dashboard
2. All Demands
3. LP (Local Purchase)
4. Issued Items
5. DR (Demands Returned)
6. AA (Authority Awaiting demands)
7. NT (Not Processed Demands)
8. IO (Issue Orders)
9. Date Wise Data

a) *Dashboard*

Dashboard was the first sheet in the new demand management system. It was contained of command buttons and textboxes as shown in Fig.5. Various sections of dashboard are discussed below individually.

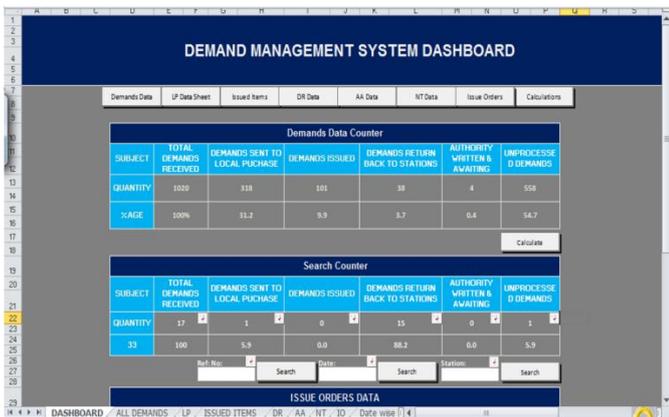


Figure 5. Demand management system ‘dashboard’ worksheet

b) *Dashboard Command Buttons*

Command buttons are arranged in series at the top of dashboard (see fig. 6); each button led to the different worksheet (mentioned in its caption) after pressing it.



Figure 6. Dashboard Command Buttons

These buttons are inserted to make the interface more user-friendly. The main function of these buttons was to lead the user to different worksheets as required.

c) *Demands Data Counter*

This counter calculates the total number of demands received (see fig. 7), demands sent to local purchase, issued demands, demands that were returned back to stations, and the demands that are not processed yet.

Demands Data Counter						
SUBJECT	TOTAL DEMANDS RECEIVED	DEMANDS SENT TO LOCAL PURCHASE	DEMANDS ISSUED	DEMANDS RETURN BACK TO STATIONS	AUTHORITY WRITTEN & AWAITING	UNPROCESSED DEMANDS
QUANTITY	1020	318	101	38	4	558
%AGE	100%	31.2	9.9	3.7	0.4	54.7

Figure 7. Demands data counter in dashboard worksheet

The command button below with the caption of calculate was programmed to calculate the values of mentioned demands.

d) *Search Counter*

The counter as shown in the fig.8; it provided the searching facility of demands by their corresponding stations, date and corresponding reference number.

In the traditional DMS the user faced the difficulty of searching demands; in case of query from the demanding stations about any of their demand, then he used to apply filters individually and used to get the results but now, the user could search in efficient and effective manner by writing any of the detail in any of three textboxes as shown in the fig. 8 below.

Search Counter						
SUBJECT	TOTAL DEMANDS RECEIVED	DEMANDS SENT TO LOCAL PURCHASE	DEMANDS ISSUED	DEMANDS RETURN BACK TO STATIONS	AUTHORITY WRITTEN & AWAITING	UNPROCESSED DEMANDS
QUANTITY	17	1	0	15	0	1
33	100	5.9	0.0	88.2	0.0	5.9

Ref: No:  Search      Date:  Search      Station:  Search

Figure 8. Search counter

e) *Filters*

The small command buttons on the right corner of textboxes and cells were used to filter the details. On pressing, it filtered the six sheets (Demands Data, LP, Issued Items, DR, AA and NT) accordingly the value or text entered in the given textboxes i.e. I enter Nawabshah in the first textbox having label of station.

After pressing the small command button given on the right corner, the demands in all the worksheets were filtered (see fig. 9). These operations were named as filters but the purpose of VBA was to automate the manual function of the excel worksheet in order to reduce the time and efficiency.

Search Counter						
SUBJECT	TOTAL DEMANDS RECEIVED	DEMANDS SENT TO LOCAL PURCHASE	DEMANDS ISSUED	DEMANDS RETURN BACK TO STATIONS	AUTHORITY WRITTEN & AWAITING	UNPROCESSED DEMANDS
QUANTITY	17	1	0	15	0	1
	33	5.9	0.0	88.2	0.0	5.9

Figure 9. Textbox with highlighted text were used for filtering data

Then, after clicking the small command button in the right corner of first cell; it led to the worksheet where those 17 demands were kept (see fig. 10).

DEMAND DETAILS						
18	NH-14	NAWABSHAH		25-Jul		OIL FILTER P.NO 2654A(II) P/O 200 KVA GENERATOR
19	NH-15	NAWABSHAH		25-Jul		AIR CLEANER P.NO CV9685-10A01 P/O 250 KVA GENERATOR F.G WILSO
20	NH-16	NAWABSHAH		25-Jul		K-007-0166 OIL FILTER P.NO LF-3356 P/O 250 KVA GENERATOR
93	NH-17	NAWABSHAH		2-Aug		G-018-0317 FILE COVER CAA-020
164	NH-18	NAWABSHAH		21-Aug		BATTERY PACK OF WALKI TALKI GP-2000 (PM) MOTOROLA (REQ FOR RE
165	NH-19	NAWABSHAH		21-Aug		C-046-0106 TERMINAL STRIP 6 PAIR (SCREW TYPE) (REQ FOR D.B OF TELEPHONE CAE
166	NH-20	NAWABSHAH		21-Aug		C-046-0044 TERMINAL STRIP 8 PAIR (SCREW TYPE) (REQ FOR D.B OF TELEPHONE CAE
348	NH/21	NAWABSHAH		9-Sep		Q-017-0001 WIND SOCK ORANGE COLOR
349	NH/22	NAWABSHAH		9-Sep		OPERATOR LOG BOOK CAA-074
350	NH/23	NAWABSHAH		10-Sep		M-066-0397 AIR CHARGING PLUG (MALE/FEMALE) P/O BRACUDA (L-08-B)

Figure 10. Filtered data by the help of textboxes below search counter

f) All Demands (Worksheet)

This was the main worksheet in which the user inputted the demands and data was transferred from this worksheet by the help of command buttons (see fig. 11).

Dashboard	Update All	Remove Filter
Update LP	Update Issuance	Update DR
Update AA	Update NT	

Figure 11. All demands worksheet

In this worksheet, the data could be transferred to the different worksheets (LP, Issued, DR, AA, NT) separately by the given command buttons i.e. update LP, Update Issuance, Update DR, Update AA, Update NT, or the data could be organized in all worksheets by just clicking 'Update All' as shown in the fig. 11.

g) LP Worksheet

Old DMS (Demands Management System) was containing the LP sheet having the demand's details sent to local purchase section, same worksheet was featured with the command buttons to improve the functionality of worksheet. The nature of the data was same as it was before as shown in the fig.12. This worksheet was featured with the functionality that the user

could copy the data from 'demands data' and paste into its area. All pasted demands could also be erased by 'Refresh' command button (see fig. 12).

DEMAND NO.	STATION	ERP Number	DATE	REF NO	SHORT DESCRIPTION
4	A/70	GGD (S)		44224	M-074-0104 WATER BODY ASSTY REQ FOR GA-040 LC (S)
5	A/70	GGD (S)		44224	M-074-0104 TIMING BEARING REQ FOR CA-490
6	A/70	GGD (S)		44224	M-074-0104 TRIMMING BEAT REQ FOR GA-484 LC (S)
7	A/70	GGD (S)		44224	M-074-0104 AIR FILTER REQ FOR GA-484 LC (S)
8	A/70	GGD (S)		44224	M-074-0104 OIL FILTER
9	A/70	GGD (S)		44224	M-074-0104 OILSKIN HELM (P) REQ FOR GA-484 LC (S)
10	A/70	GGD (S)		44224	M-074-0104 PAN BEAT REQ FOR GA-484 LC (S)
11	A/70	GGD (S)		44224	M-074-0104 CAP (TYPE FILLING) REQ FOR FCT L-15-B EX-AU/NAWABSHAH

Figure 12. LP worksheet

All other remaining worksheets such as; DR (Demands Returned), AA (Authority Awaiting demands), NT (Not Processed Demands), IO (Issue Orders) were featured with the same command buttons and so the functionality.

In this worksheet, demands of each section per of each day, month, year were counted so that the demand statistics could be maintained (see fig.13).

DATE	JANUARY				FEBRUARY				MARCH									
	DATE	LP	ISSUED	DR	AA	NT	DATE	LP	ISSUED	DR	AA	NT	DATE	LP	ISSUED	DR	AA	NT
1							1						1					
2							2						2					
3							3						3					
4							4						4					
5							5						5					
6							6						6					
7							7						7					
8							8						8					
9							9						9					
10							10						10					

Figure 13. Data wise counting worksheet

VII. 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.

VIII. DISCUSSION

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][28]. In Microsoft windows, VBA technology is provided on the platform of many software [29][3][30]. Currently, companies, employees are promoted for gaining the skills and knowledge of using excel and VBA [31]. 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][22][32][30][29]. Basically it is known for automating the routine work in existing office productivity applications [4][31]. 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 [22]. A code is required to run the operations automatically [22][30][8]. 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 [33]. 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 through VBA in excel Kalwar and Khan (2020) automated the provision report at the planning and costing department of the compan through which 75% of the employee's time was saved [8] 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 [23]. 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].

## IX. CONCLUSION

Dashboard provided the good and interesting interface to work on, which was consisted of command buttons at the top which led the user to go to the different available sheets.

It was featured with the counters i.e. first counter provided the frequencies of processed, issued, awaiting and returned

back demands; second counter provided interface to track the demands by date, station and reference number. These all counters were using 'countif' formula for counting the required cells.

The new DMS was less time consuming to operate as compared to old DMS; because on pressing the buttons the data was copied and pasted into the different worksheets. Although, these operations could be done by applying the filters and then copying and pasting the data in different sheets; but it was time consuming job thus VBA was used to automate the manual operation of workbook with the objective of reducing overall time for performing the different activities in demand management system.

## X. 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 bring its accuracy.

## CONFLICT OF INTEREST

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

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How to Cite this Article:

Chaudhry, A. K., Kalwar, M. A., Khan, M. A. & Shaikh, S. A. (2021). Improving the Efficiency of Small Management Information System by Using VBA. International Journal of Science and Engineering Investigations (IJSEI), 10(111), 7-13. <http://www.ijsei.com/papers/ijsei-1011121-02.pdf>

