

## The automatically generated system based on VBA

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**Abstract.** Using Excel to design questionnaire, it is convenient for data collection and statistics, also it is low cost and high efficiency. But it is not easy to design user-friendly questionnaire by Excel. It also brings heavy workload and chance for error injection. To this, one new questionnaire automatically generated system designed based on Excel VBA language. The system can generate Excel format questionnaire based on word file and finish data summarization and statistic.

### Introduction

To make questionnaire by Excel, the general flow are as below. 1) Insert the controls such as option buttons, combo boxes, check boxes, text boxes etc. to one worksheet. It can be used for the user input easily, at same time it also ensured that the user can answer correctly as required. 2) Create links between controls and cells to record each survey results. 3) Read all questionnaire survey data into summary table for statistical counting.

But in Excel, in case there are large number of questions and options, the design of the questionnaire is not an easy job. According to the different requirements of different questions, position and alignment of controls need to be considered, and the size of controls need to be adjusted when controls inserted. There is room for error when manually creating the link between controls and cells, which will have impact to statistic result.

To solve this issue, one questionnaire automatically generated system designed in the paper based on VBA. All the questions and answer options will be input to one blank word file firstly followed required format. Then excel format questionnaire can be generated automatically after the word file loaded by VBA program.

### System design philosophy

The new questionnaire automatically generated system is a tool to generate questionnaire easily for the sponsor and provide user friendly interface for users under survey.

Microsoft Word is the most popular word processing software, which can be used to input questionnaire content and options. Microsoft Excel has powerful data handling capacity to do survey data processing and statistic, and Visual Basic for Application (VBA) is the most widely used Office macro language. By VBA program, loading the word file with questionnaire contents and options, the system can generate excel format questionnaire efficiently.

The system main functions are as following. 1) Provide Word templates based on questionnaire format, which will define the style format of the “Label”, “ComboBox”, “OptionButton”, “TextBox”, the “CheckBox”, and “ActiveText” etc. 2) Load the Word file to generate Excel questionnaire. In the questionnaire, links will be established between controls and cells. The controls are generated according to the format used by each paragraph. The size and position of controls will be adjusted automatically based on the size of content and position of previous control when they are generated. The questionnaire will be protected automatically to guarantee the survey data safety and security. 3) Collect all the survey data of the questionnaire and count statistics result automatically when users completed the questionnaire.

## System Concrete Implementation

**Create questionnaire data source file.** A new Word file need be created as questionnaire data source to input all the questions provided by questionnaire sponsor with name QuestionnaireSample.dotx. Some styles name should be defined in the QuestionnaireSample.dotx, such as “Label”, “OptionButton” , “CheckBox”, “ComboBox”, “TextBox”, “ActiveText “ etc. In the data source file, all the topic, questions and answer options must be located in separated paragraphs. The question number should be started from 1 and answer option numbers should be started from “A” or “a”.

The topic of the questionnaire uses “TextBox” style in general. The questions use the style of “Label” style. Single selections are recommended to use “OptionButton” style or “ComboBox” style. Multiple selections use “CheckBox” style. If any content requires user’s input for some questions, “ActiveText” style should be used for the answer. In a word, the system can use different controls to accommodate the requirements of different questions and answer’s type flexibly. Fig.1 shows example of styles in data source file.

Mobile phone market survey	“TextBox” Style
1. Gender	“Label” Style
A. female	“OptionButton” Style
B. male	“OptionButton” Style
2. Age	“Label” Style
A. 18 years old	“OptionButton” Style
B. 25 years old	“OptionButton” Style
C. 40 or above	“OptionButton” Style
3. Degree of satisfaction about your smartphone	“Label” Style
A. Quite satisfied	“ComboBox” Style
B. Satisfaction	“ComboBox” Style
C. Basically satisfied	“ComboBox” Style
D. Dissatisfied	“ComboBox” Style
4. From where you can know smartphone?	“Label” Style
A. Advertising	“CheckBox” Style
B. Magazine	“CheckBox” Style
C. Broadcast	“CheckBox” Style
D. TV	“CheckBox” Style
E. Network	“CheckBox” Style
F. Others	“CheckBox” Style
5. What kind of mobile do you expect?	“Active Text” Style

Fig1. Example of styles in data source file

**Generate Excel format questionnaire.** The key function of this system is to generate the questionnaire. The main tasks include:

- Read data source file created by “QuestionnaireSample.dotx “.
- Handle each paragraph in sequence.
- Generate final Excel format questionnaire workbook.

In the new workbook, there are three worksheets which named “Questionnaire”, “Statistics” and “Datasource”. The content of the questionnaire created in worksheet “Questionnaire”.

The system will judge each paragraph’s style when read questionnaire data source file. If the paragraph’s style is “TextBox”, the system will insert text box in the specified position of “Questionnaire” worksheet. The content of this paragraph will translate to text into the text box. And the text font also can be configured. If the style of the paragraph is “Label”, the system will insert Label (Form Control). The content of this paragraph will translate to the content of the Label control. If the style of the paragraph is “OptionButton”, the system will translate all the paragraphs between two questions to multiple sets of option buttons with Group Box (Form Controls). If the style of the paragraph is “CheckBox”, the system will translate all the paragraphs between two questions to multiple check boxes with Group Box (Form Controls). If the style of the paragraph is “ComboBox”, the system will translate all the paragraphs between two questions to items of a drop-down list of combo box (Form Control) and stored to “Datasource” worksheet. If the style of the paragraph is “ActiveText”, the system will insert ActiveX TextBox control.

In order to collect data, all above controls will be linked to the sequence cells of the first line in “Statistics” worksheet. Especially each check box control need link to different cells. When users click the option button control, combo box control to choose different option, the index of the option

will feedback to the linked cell. The value “TRUE” will be return to linked cell if check box control selected. Vice versa, the value “FALSE” will be return to linked cell if check box control not selected. The content of ActiveX TextBox control will feedback to linked cell directly.

At the same time, the title sequence number of question will be generated in the third line of “Statistics” worksheet, such as 1, 2, 3, etc. But, if there are multiple options for one “CheckBox” question, for example, question 4 had multiple options, the system will generate multiple numbers as 4\_1, 4\_2 etc.

Finally, the system will insert ActiveX command button in “Questionnaire” worksheet. The Caption attribute of the button is "Submit". When the button clicked, all the options will be checked. If any item left as blank, the answer will not be submitted. After the answer submitted, the data in first line of “Statistics” worksheet will be copied and appended to the end of a data area which begins from line 3. Then the data in first line will be cleared.

According to the different styles, the system can generate continuously and left-aligned controls. And the links between option’s controls and sequence cells in “Statistics” worksheet need be established. For the control of combo box, combo box selections should be created in the worksheet of “Datasource”.

To be left aligned and fixed width for all controls, the left margin and the top margin defined between all controls and the nearest upper left cell of column A. By default, the left margin is 20, the top margin is 0, and the height is 18. Allowable maximum width is 600. When the first control inserted, the position of the control shall start from line 1 if authentication not need. Then the row number of upper left cell of next control is lower right cell’s row number of previous control plus 1 and column number is still A.

Each time the control inserted, the characters number X of the control’s content will be calculated and the width of control is  $X \times 4.6 + 10$ . If control width is more than the maximum width, the additional part will be displayed in next new line. The actually row number should be width of control divided by maximum width and plus 1. The height of control can be derived from the actually row number. But one exception for the ActiveX TextBox control, its width is the maximum allowable width, and the height is 4 times default height.

After above program executed, Excel questionnaire generated with vertical format. In Excel, multiple objects can be moved at the same time, it is very convenient to adjust the position of control objects. Select the area of the cell included controls to be moved by mouse, drag to new position. During generation of controls, as the top margin between top of controls and related cells is always same, it is easy to be top alignment. As shown in Fig.2.

In order to guarantee the impartiality and security of the questionnaire survey data, authentication and data protection had been implemented in questionnaire workbook by the system.

When any users accept the questionnaire survey, some mandatory information is required such as id number etc. This info will be saved to the first line of “Questionnaire” worksheet and finally read to the “Statistics” worksheet with the user survey results. To prevent the questionnaire content modified unauthorized, the worksheet of “Statistics” and “Datasource” will be hidden, and the structure protection of workbook also be configured. In parallel, the “Questionnaire” worksheet protection implemented and control objects’ edit is not allowed.

**Data Consolidation and Statistic.** The system will complete the questionnaire result consolidation and statistics as following:

- Store all completed questionnaire workbook file to one directory.
- Select all workbooks to be summarized.
- Copy all data in questionnaire workbook “Statistics” worksheet from row number 4 to “Total” worksheet of a new workbook. The new workbook includes two worksheets, “Total” and “Count”.
- Remove invalid data through the screening function after data summarized.
- Complete statistic for all valid data.

Fig.2 Excel questionnaire after adjustment

To count the number which had been selected for each option of one question, the number of answer options for one question need be considered first. Therefore, the data source file created by “QuestionnaireSample.dotx” will be reloaded again. Then the system will process each paragraph in sequence based on paragraph styles, record the question number and options number, generate statistic table in “Count” worksheet. For example, there are 2 single options for question 1. Two titles will be generated in statistic table like 1\_1 and 1\_2 and the question’s option will be comments. The first number means the question number, the second number means option number. If there are multiple options for question 4, such as 6, the title should be 4\_1\_true, 4\_1\_false, 4\_2\_true, 4\_2\_false etc. In the program, the function “COUNTIF” will be used to count options number from “Total” worksheet.

## Conclusions

In this paper, the implementation scheme of Questionnaire automatic generation system presented and concrete implementation method had been introduced. Because this system is based on Excel VBA, obviously advantages are low development cost, high efficiency and facility. Final result of Excel type statistical data, generated by this system, is also convenient for further analysis. In a word, Questionnaire automatically generated system is high practical value innovation and can be applied widely in much function area.

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