

EFFECTIVE COMPUTER TECHNIQUES FOR FUNCTIONAL ANALYSIS

Peter T. Waterhouse, FNZIQS, AIArb, MNZIOB, MIVMA
Quantity Surveyor, Construction Cost Engineer
Auckland, New Zealand



Mr Waterhouse is a Director in a consultant firm that is associated with WT Partnership International, a world-wide group of Quantity Surveyors and Construction Cost including one year working in Europe. For the past five years he has been involved in the facilitation of Value Management studies, generally in relation to construction projects. He attended his first SAVE Conference in Phoenix in 1995 and has since obtained a Graduate Certificate in Strategic Asset Management, specialising in VM facilitation, from the University of Canberra, Australia. Recently he has diversified into facilitation of strategic planning for corporate management

ABSTRACT

This paper outlines some of the applications of computer technology to the Value Management/Value Engineering process. In particular it describes techniques successfully used in the Functional Analysis phase to produce diagrams. Use is made of a laptop computer, data projector and screen. The process is particularly beneficial when large groups of people are involved. Inputs are clearly and readily recorded, participants are easily encouraged to contribute and considerable time can be saved. Presentation of this paper at the SAVE 1998 International Conference will provide live demonstration of the techniques involved

INTRODUCTION

Successful future implementation of the Value Methodology will depend upon advanced standards of facilitation skills and communication techniques. They are an important factor in maximising the input of people resources involved in strategic planning and project development

On one hand, there is broad commonality of core components upon which the Value Methodology is practised world-wide

In particular, the key steps involved in Value Management and Value Engineering provide a well-proven and reliable basis for obtaining value improvement whenever the process is applied

On the other hand however, there are considerable variances in delivery. Facilitation skills

and techniques differ widely and this should be openly encouraged. These are the elements of the Value Methodology in which there is considerable ongoing potential for individualism and adaptability to take full advantage of developing technology

COMPUTER APPLICATIONS

Computers and visual communications technology offer seemingly unlimited resources for assisting and improving the facilitation process. They have been in use for some time and will already be familiar to many facilitators and study participants. As an example of this, Gary Morgan, Architect from Issaquah, Washington, outlined his use of computer techniques in a paper to the SAVE 1995 International Conference

Rather than recording the inputs of participants by freehand on flipcharts, whiteboards or overhead transparencies, extensive use can be made of spreadsheets on a laptop computer. These are displayed simultaneously on a large screen through a data projector. This offers significant advantages:

- Inputs are frequently more legible
- They are easily and clearly amended
- Ranking and order of items can be easily rearranged and revised
- Recorded outputs are printed promptly, well presented and clearly understood
- Calculations can be automatic by formula
- Sheets can be easily reviewed by all participants at any stage and quickly amended if required

The facilitator should not be involved on the laptop but left free to interact with all participants so as to more effectively encourage their input

Facilitation tools such as these are particularly helpful when large study teams are involved, of up to 20 or 25 people. There have been many instances of this on major construction projects where it has been of considerable benefit to involve a wide range of key stakeholders, together with the consultant design team and cost engineers

This produces a strong collective "ownership" of study outcomes, beneficial team building relationships are generated and commitment to the success of the project is frequently enhanced

A particularly interesting and highly successful project VM Study on which the laptop spreadsheet/data projector and screen technique was first used was in planning the restoration of a major "atmospheric" theatre (Fig 1). The study group of 26 people included representatives of the City Council which owned the 80-year-old 1,800-seat theatre, an international promoter of major live theatre productions, interested conservation groups, together with the design team and cost engineers

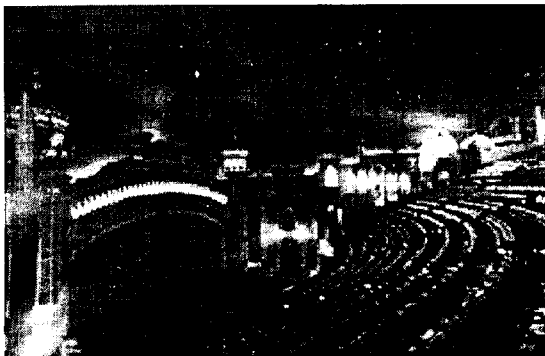


Fig 1 "Atmospheric" Theatre restoration

During the Information phase of the VM study the participants collectively:

- Established key Objectives of the refurbishment (Fig 2)
- Raised Issues and Concerns
- Identified Risks and Opportunities
- Established project Givens and Assumptions

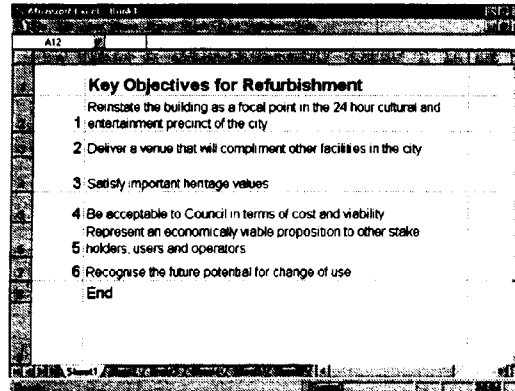


Fig 2 Key Objectives spreadsheet

The extent to which computer assisted techniques can be applied to inputs such as these is almost unlimited. Recording of outcomes in every phase of the study can be simplified and more efficient

A standard file of spreadsheets is prearranged for each phase of the Study. These are labelled at the foot of the screen for easy identification and access

During the Evaluation phase, matrixes such as Paired Comparisons (Fig 3) and Weighted Evaluation sheets can have prearranged formats and be armed with calculation scenarios for instant results

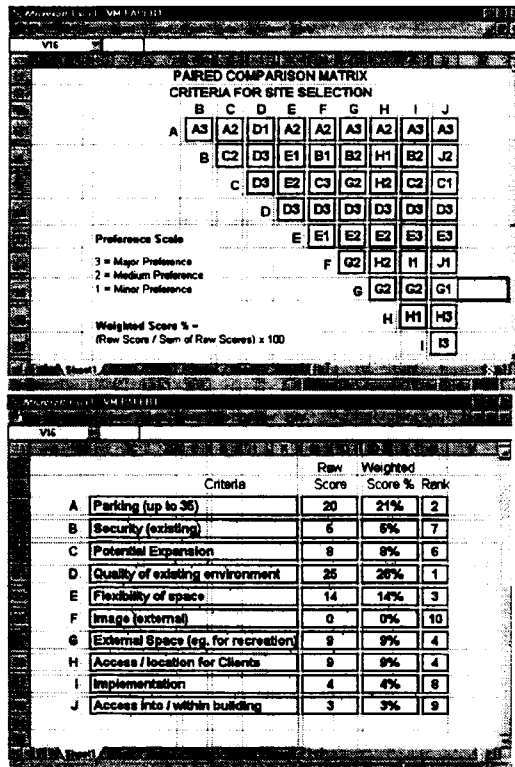


Fig 3 Paired Comparisons Matrix spreadsheet

Added interest can be generated by incorporating graphic displays (Fig 4) through Powerpoint, Astound or other similar multimedia software

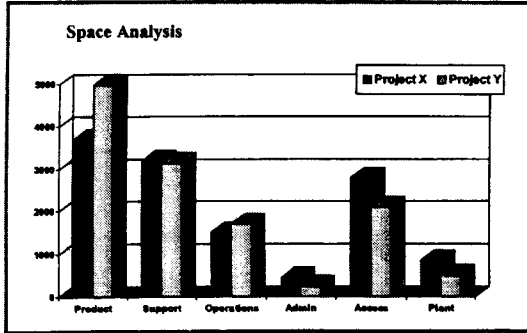


Fig 4 Space Analysis graphic on PowerPoint

FUNCTIONAL ANALYSIS

They key Functional Analysis phase of VM/VE is likely to have given rise to uncertainties and frustrations for numerous facilitators and participants, particularly where some of the participants are not familiar with the process

What should be an effective and constructive phase of any study may sometimes have been difficult to conduct, particularly with a larger group of people. It may also have taken considerable time and appeared to be inefficient

The computer laptop/spreadsheet/data projector techniques can be effectively applied to facilitation of Functional Analysis just as well as they are to other phases of any VM/VE study

Blank "boxes" are pre-arranged in a "layer" over the top of conventional "cells" on an Excel spreadsheet. Each "box" has the facility to accommodate text that is bold, centred and has autowrap. "Boxes" can be moved to any position on the sheet, replicated, enlarged or reduced

The process is clearly visible to all of the participants. Amending or inserting text related to any of the function "boxes" is quick, clear and simple

At the outset "boxes" are "parked" to the side or foot of the sheet. As each function is identified by the study team, text is inserted into the "box" and the "box" is temporarily positioned on the sheet (Fig 5)

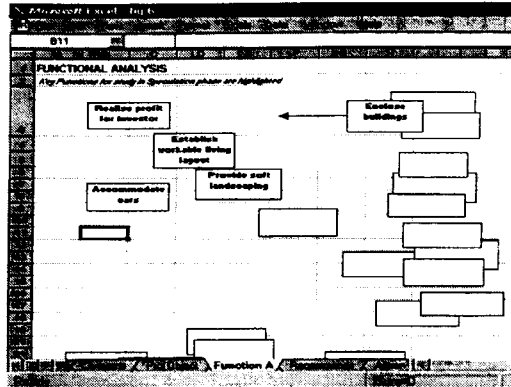


Fig 5 Spreadsheet "boxes"

Regardless of whether the Functional Analysis is based on a FAST (Fig 6) diagram, or any other structure that establishes functional relationships such as hierarchical "levels", the computer sheet can be provided with bold divisions and/or linkages between function "boxes"

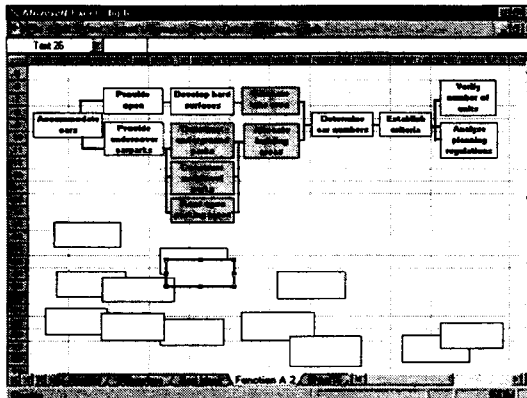


Fig 6 "FAST" diagram spreadsheet

When weightings or values are being applied to functions these can be easily added within each "box" or provided as an "outrigger"

When the study team selects any function for particular attention in the Speculation or Creative phase of the VM/VE study, individual function "boxes" can be highlighted with a colour for instant identification

A most effective recent use of the technique was during a VM study related to development of an inner harbour basin which is to accommodate the fleet for the 1999-2000 Americas Cup yachting regatta in Auckland (Fig 7). The study team included a wide

cross-section of interested parties, including existing and post race (non-yachting) users of the basin who had particular concerns for impact that the development could have on their operations



Fig 7 Americas Cup yachting regatta base, Auckland

Despite widely varying interests and first time exposure to Functional Analysis, the computer technique was of considerable assistance to all participants by making the process simple, interesting, easily viewed (Fig 8) and highly effective

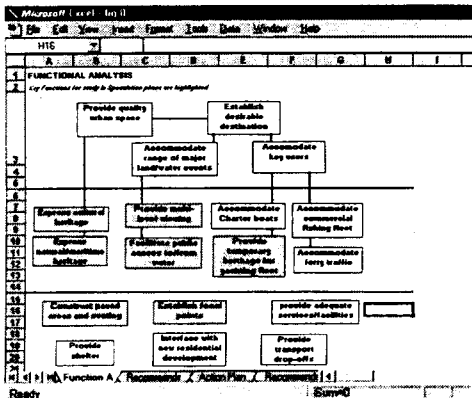


Fig 8 Functional Analysis spreadsheet

TECHNICAL DETAILS

Function “boxes” can be “layered” over a standard Excel worksheet by the following process:

- Use “View” menu, “Toolbars”, “Drawing”, or alternatively the “Drawing” icon on the toolbar
- Select the “Text Box” icon (has lines in box) and select centred alignment on the toolbar
- On the spreadsheet the cursor becomes a fine cross and the Function “box” is formed by holding down the left mouse button and “dragging out” a “box” of any size
- When the mouse button is released the cursor returns and a flashing line calls for text in the

“box”. You can then click the cursor anywhere else on the sheet

- Position the cursor anywhere at the edge of a “box” to “drag” it into any location on the sheet, or at the corner of a “box” to change the shape or size
- To replicate “boxes”, click onto any “box” using the right mouse button and then use the “copy” and “paste” options
- Text within “boxes” can be pre-set for bold font of an appropriate size for maximum clarity
- Linkages between “boxes” or divisions on the sheet can be formed with bold lines between “boxes” or in zones as required
- Function “Boxes” selected for attention by the study team can be highlighted by clicking onto the “box” and selecting a colour from the colour range within the toolbar
- “Outriggers” can be added to “boxes” to accommodate values or rankings by appending another “box” with the drawing tool

There are some interesting and effective alternatives to using Excel for the Functional Analysis “boxes”. Presentation software such as Power Point and Astound provide greater flexibility and a wider range of operating opportunities. In this situation, any number of Excel spreadsheets can be left “open” at the same time as the presentation software is being used to record the Functional Analysis session in PowerPoint or Astound

The laptop operator can instantly key back to an Excel spreadsheet at any time. An example of this is when a key function is identified in the Functional Analysis phase for special attention in the Speculation phase. At that point the laptop operator keys back to a spreadsheet established for Study Group speculation topics and records that particular function

SUMMARY

Use of computer laptops/spreadsheets/data projectors and screens in VM/VE studies is likely to become common. Facilitators find the technique more efficient and of particular assistance when larger teams and groups of people are involved because inputs and outputs are more effectively recorded and reviewed

These computer techniques can be applied to all phases of each study, including Functional Analysis, to considerable benefit

The Functional Analysis session is likely to be clearer, more easily understood and more effective for facilitators and participants alike

Most importantly, the application of computer techniques to VM/VE facilitation saves valuable time and is of considerable assistance by providing more focused input by participants

These techniques offer significant contribution to successful future implementation of the Value Methodology

Reference

- Gary Morgan, "Two Phase VE Workshop to Analyse Functional Relationships in Educational Design", *SAVE Proceedings 1995 International Conference*, pg 32-34
- "Excel" and "PowerPoint" are trademarks of Microsoft Corporation and "Astound" is a trademark of Astound Incorporated