VALUE MANAGEMENT AS AN EFFECTIVE AND EFFICIENT TOOL FOR SPACE MANAGEMENT

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ABSTRACT: Construction Industry still has a limited understanding and implementation of a delivery mechanism that fulfils better customer or user value with regards to building space planning and management where design development is in its traditional state of segregating the Design Team and the Facilities Management Team. In many cases the lack of understanding of end user requirements lead to inefficient space utilization. This paper presents the concept and the application of Value Management Methodology and how it links to space planning and management. This was based on the successful application of value management in space planning and management and the references were made to the relevant literatures. Value Management is discussed in this paper as a Group Problem Solving Methodology due to its increased recognition throughout the world and marked level of success in both public and private sectors. The structured functional analysis is very significant during the Value Management Methodology in achieving effective and efficient space utilization.

Keywords: Function Analysis, VM Job Plan, FAST Diagram, Space Planning, Asset

1. INTRODUCTION

Value Management at present is currently widely used in many developed countries and attracting considerable attention in certain developing countries.

New South Wales, Department of Public Works and Services (1992) described Value Management as a structured, analytical process for developing innovative, holistic solutions to complex problems. It involves representatives of key stakeholders in facilitated workshop.

Che Mat, M.M (2004) defines Value Management as a rigorous, systematic and innovative methodology with multi disciplinary approach to achieve better value and cost optimisation for projects, products, facilities, systems and services without sacrificing the required performance levels.

Applying the concept and purpose of facilities management, we can define space management as an effort to provide effective and efficient utilization of space towards achieving optimum returns to the people, organization and stakeholders.

The lack of performance during the life span of a building is generally attributed to bad design practice through poor understanding of performance and compatibility of elements or components also of purpose and expected function of the spaces within the building. The designer should also understand thoroughly the work process and relationship between and among the units within the organization using the building.

Understanding the above definitions and its applications clearly indicate the importance of effective and efficient value delivery in design, where it is of a paramount important to consider and linked the design development with its impact on the resulting products and completed projects.

This paper presents the concept of Value Management process, application and how Value Management assists towards achieving effective and efficient space utilization.

1.1 Concept of Value Management

Value Management is a rigorous, systematic effort to improve the value and optimize the cost of project, facilities and system. Value Management generates these cost improvements without sacrificing the needed performance levels. It is a creative way of working together in achieving client and stakeholder's requirements. **Miles** in the original context of Value Management then called Value Analysis defined as *"philosophy implemented by the used of the specific of techniques, a body of knowledge, and a group of learned skills".* **Dell `Isola (1982)** later simplified the definition as *"the creative organized approach whose objective is to optimize and/or performance of a facility or system."*

Value Management has been defined in other number of ways such as:

- Kelly and Male (1991) define Value Management as an oriented effort to attain optimum value in product, system or services by providing the necessary functions at the lowest cost.

- Australia's Department of Defence, reference book DRB 37 defines Value Management as "*the systematic effort directed at identifying the functions of systems, equipments, facilities, procedures and supplies for the purpose of achieving the essential functions at the lowest cost consistent with the needed purpose, performance, reliability and maintainability."*

Kelly and Male (1991) characterized Value Management by being:

- Systems oriented - uses a formal job plan and remove unnecessary costs.

- A multi-disciplinary team approach – teams of experienced designers, estimators and Value Management Consultants.

- Life cycle oriented - examines the total costs of owning and operating a facility

- A proven management technique

- Function orientated – relates functions required to the value received.

Bone and Law (2000) identified ten mandatory characteristics of Value Management practice:

1. It is visibly supported by senior management.

2. It generates a clear program of work.
3. It involves structured team-based workshops.
4. It employs a range of analytical tools.
5. It involves creative brainstorming.
6. It is led by a qualified value practitioner.
7. It follows a structured 'Job Plan'.
8. It involves customers.
9. It involves suppliers.
10. It causes study terms to achieve sustained improvements.

According to Ibrahim J. (2005), amongst the benefits of Value Management implementation during design stage are:

1. Identify and eliminate unnecessary capital costs.
2. Identify and eliminate unnecessary operation and maintenance costs.
3. Considering the optimum life cycle costing, where the relative high initial cost but more economical operating and maintenance costs.

The relationship between Value, Function (Worth), Quality and Cost can be symbolized as follows:-

$$\text{Value} = \frac{\text{Function} + \text{Quality}}{\text{Cost}}$$

Where:

Function = The specific worth that a design/item must perform

Quality = The owner's or user's needs, desires, and expectations

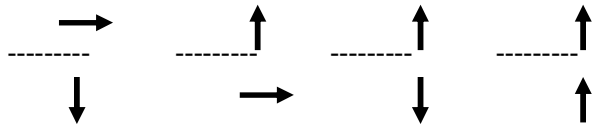
Cost = The life cycle cost of the product/project.

Therefore, we can say that:

Value = The most cost effective way to reliably accomplish a function that will meet the user needs, desires and expectations.

As such, value can be increased by the following approaches:

$$\text{Value (V)} = \frac{(F) + (Q)}{(C)}$$



Cost Reduction Approach	Function Increase Approach	Compound Approach	Expand Growth Approach

At the core of Value Management process is the analysis of functions of the system as a whole

1.2 Function Analysis.

Function Analysis involves clearly identifying what things actually do, or what they must do to achieve the project objectives. Through the analysis of functions, it is possible to identify the wastage, duplication and unnecessary expenditure thus providing the opportunity for value to be improved. The function analysis perspective not only enables Value Management to explore the project and /or program brief but also test the assumption and needs perceived by the author of the brief.

Larry Miles, in his book Value Analysis and Engineering states (with minor modification) by Roy Barton (1996): *The heart of the situation is the customer wants a function. The customer wants something done. The customer someone perhaps, him or herself, pleased. The customer wants something enclosed, held, moved, separated, cleaned, heated, cooled or whatever, under certain conditions, and within certain limits, and/or the customer wants a shape, a colour, an aroma, a texture, a sound, a previous material or whatever to bring pleasure to him or herself or others that he or she wishes to please. That is all customer wants. That is all customers cares about. Thus, the language of function is the language of the heart of the problem. The customer two and only two types of function varying degrees in different products or services –* ***use functions*** *and* ***aesthetic functions*** *serve his needs.*

2. VALUE MANAGEMENT JOB PLAN

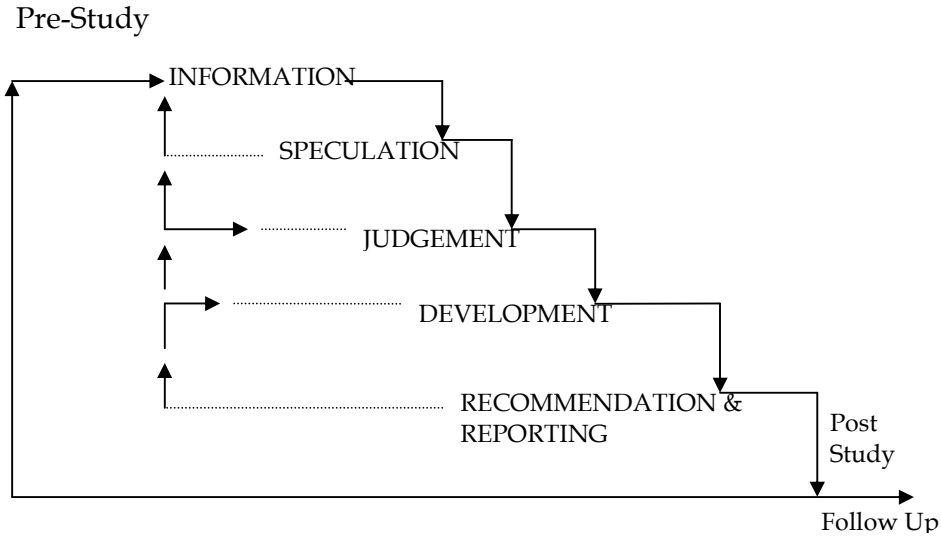


Figure 1 - Five steps of the Value Management Job Plan

The five steps of the Job Plan are shown diagrammatically in figure 1 above. The significant of the arrows is that, whilst a cascade system is used, with each phase flowing on from and using the output of the preceding phase, there is frequently reversion to a previous phase, as a result of some discovery or unexpected development.

2.1 Value Management Study

2.1.1 Pre-study Preparation

Discussions with the project client prior to the actual workshop is very important so

that each party to the study has a clear understanding of how and why a Value Management study is conducted and make known to them of their required input.

2.1.2 Information Phase

The information phase is the beginning of the Job Plan and understanding the decisions that have influenced the development of the project design is crucial. Designers are to present an oral overview of the project.

2..1.3 Speculation Phase

The information phase of Value Management study never ends as it keeps on adding as the study progresses. The Value Management team then accomplishes the creativity phase to generate as many ideas as possible.

2.1.4 Judgement Phase

Ideas generated from the creative phase are then judged as to their merits and demerits. Ideas found impractical and to be irrelevant or not worthy of additional study are disregarded. Those ideas that has potential for cost savings or improvements to the project are then developed further.

2.1.5 Development Phase

The ideas that have been evaluated and selected earlier are expanded into workable solutions. Alternative design sketches and illustrations are prepared whenever necessary. The alternative proposal is estimated preferably its life cycle cost that includes not only initial cost but operation and maintenance during its economic life span. Although each job plan phase has specific items that must be accomplished and specific cut off time and dates it does not mean that the job plan is not flexible. It may be necessary, after receiving new information, to revert back to the earlier phases of the job plan to gain information or brainstorm new ideas.

2.1.6 Recommendation and Reporting Phase

The functions of the recommendation and reporting phase are to sell recommendations, Incite action and convey information

2.3 Function Analysis System Technique (FAST) Diagram

The degree success of the Value Management Study greatly depends on the involvement of the key stakeholders in the Job Plan process. Figure 2.0 identifies the main task normally performed by the members of the Value Management team to achieve certain objectives such as identify target market, differentiate products and services and reduce cost.

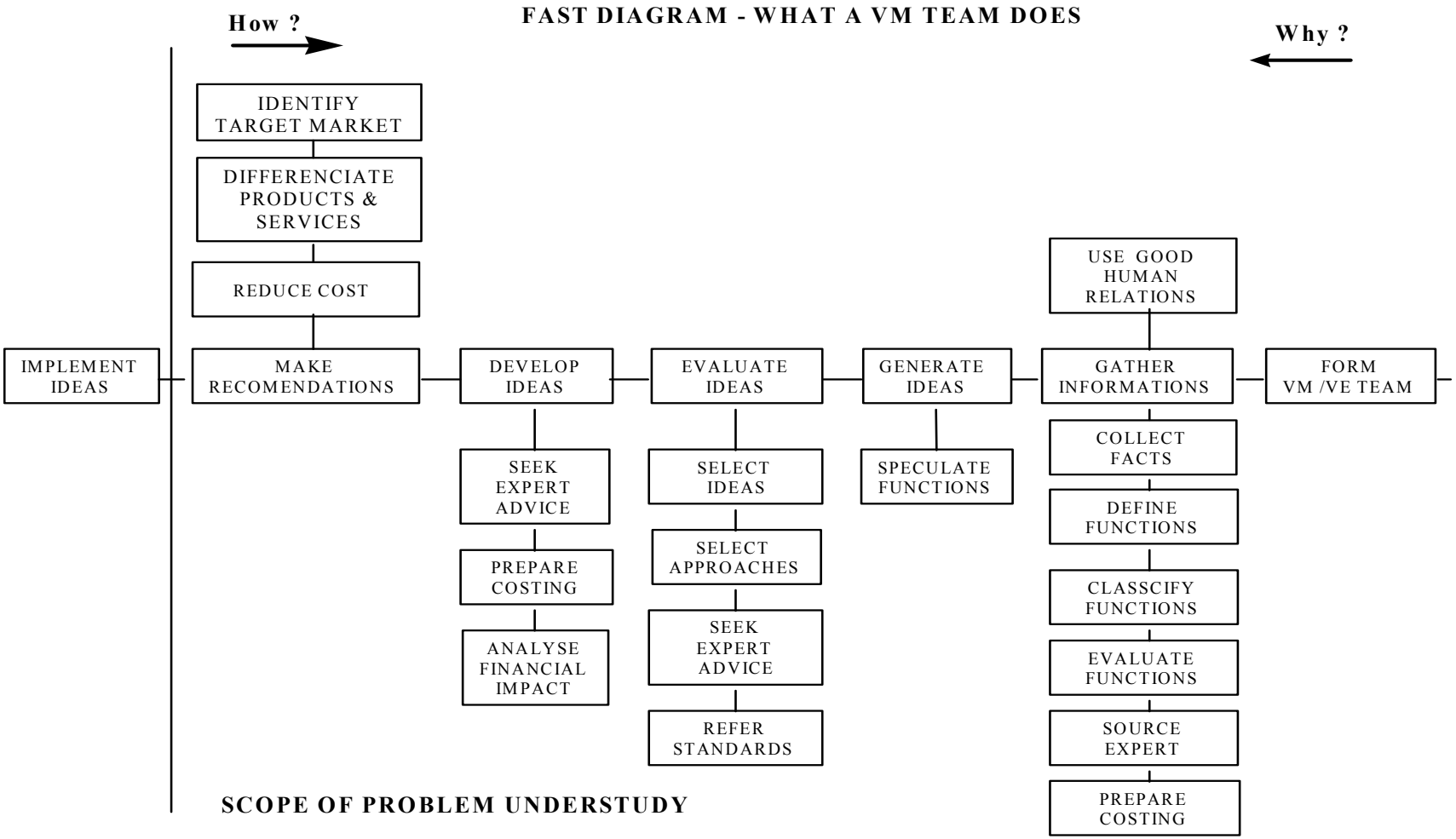


Figure 2.0 – What a VM team does ?

3. SPACE MANAGEMENT

Nao (1998) explained that the objective of Space Management is to increase the overall usage and effectiveness of existing space and reduce the need for additional space, fast response to users request and achieving harmony among the spaces provided. It would require among others:

- an organized management team or committee involving top level management.
- having up to date and accessible data bank and information on inventory of space, facilities and usage.
- able to exercise improvement of space arrangement or layout cost effectively.

Williams (1998) stated that space management have developed over the years to enable organization improve workers productivity and optimize space usage cost effectively.

Major elements used in describing space can include type of space, quantity of space (measured in numbers, floor areas, volume), facilities provided, finishes and security level. In deciding the appropriate details or design of these elements, consideration must be given to influencing factors which may vary with time or even within the organization such as availability of resources, work processes / environment, culture, user / tenant, utilization rate and regulatory requirements.

3.1 Providing Space in Organization

Space is considered as one of the critical resources that an organization has to provide and manage. This has been clearly defined in the requirement for compliance to Quality Management System standards (clause 4.0, ISO 9001:2000). Among the main purpose of space in an organization is to provide working space, security, allow circulation and receive visitors / clients or disseminate information. Well planned and managed space can contribute to cost effectiveness of the operation of the organization and give optimum returns to the organization in the usage of resources.

Alternatives in providing space for organization includes:

1- Buying new building
2- Building new building
3- Renting space
4- Extending existing building
5- Renovating and upgrading existing space
6- Rearranging layout or reorganizing space usage
7- Sharing existing space

However, when organization expands or develops, it will unavoidably experience or implement changes. This would normally include change in organization structure, management structure, work processes, technology application affecting changes to staffs and equipment. These changes require changes in the work place and if done hurriedly or in unplanned manner will cause negative impact on space usage (Williams, 1998) as follows:

- un-uniformity in standards
- varying / inefficient space loading
- drastic or major changes to space requirements and utilization.
- non conformity to regulatory requirements

3.2 Measure of Effectiveness and Efficiency of Space

Space have many attributes which contribute to the success of the works or activities of the organization. Some attributes are more necessary than others for the space to perform its role. For example, a room might need to be structurally sound, quiet, secure, and aesthetically pleasing. Another will only require the lighting maintained to very critical standards while security or aesthetics might not be of particular importance. It is therefore necessary to define broad performance requirements that establish which attributes must be provided for in a particular space.

More strategic or macro indicators can also be used to define performance requirements or effectiveness or efficiency of space usage, such as follows:

- compliance to OSHA requirement
- allow efficient flow of movement
- easy or manageable to control , ex : security
- maintain high morale and productivity of workers
- high rate of utilization
- enable to accommodate changes, high level of flexibility
- economical or affordable maintenance cost

4. APPLICATION OF VALUE MANAGEMENT IN SPACE PLANNING AND MANAGEMENT

For buildings that are already in use, determining the changes on existing space to accommodate changes in organization or work processes, are more difficult to be done, due to critical constraints that have to be taken into account as follows ;

- To minimize disruption to the ongoing or daily operations and activities of the organization
- To avoid effecting the integrity of the building's structure or the building services
- To minimize or avoid creating chain reaction of changes to be done to other facilities or space usage in other areas
- To avoid creating imbalance or different standards of comfort and usage of resources within the organization.

In the typical linear process of Space Planning and Management commonly practiced presently, concepts and solutions adopted to provide space for the organization are usually limited in options and short term in nature.

The Value Management approach provides a framework to identify the most appropriate concept and final solution which reflects best value for money and addresses the constraints described above. Opportunity is also provided to extend the user's and space owners participation in determining the final solution with better understanding of the consequences to them, not only in the immediate future but also relating it to their long term planning or vision. The process requires extensive and comprehensive planning to be done in a systematic and transparent manner, covering work process, the operational and maintenence requirements and all aspects of the organization and stakeholders' interest at strategic level.

This is illustrated in the Figure 3.0 below, which highlights the improved process by applying the Value Management. Of particular note is the added benefit to the organization in enabling them to develop their own Space Management Policy or Guideline. The Space

Management Policy or Guideline will serve the organization to:

- determine changes of space usage
- ensure consistency of standards
- effective monitoring and control of resources exercise
- ensure support to organization strategies and vision

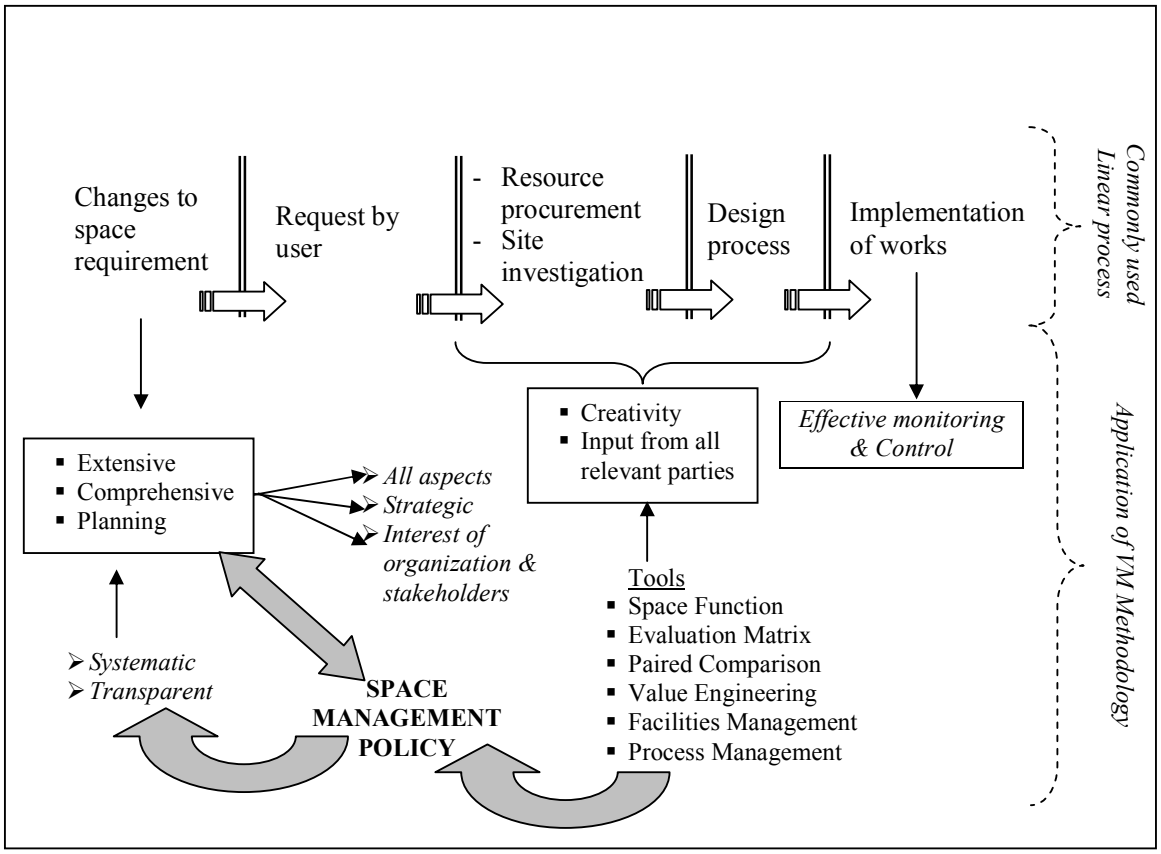


Figure 3.0 - Linear process of Space Planning and Management with improved application of VM Methodology

The involvement and contribution of facilities managers and ground personnel were importantly significant during the 2nd and 3rd stage of the workshop process in developing and evaluating options. We have achieved remarkable results during the VM Studies for several projects involving the Facilities Management Team. Two (2) cases of such application were done in Universiti Teknologi Malaysia (UTM), Skudai, in the planning of spaces for two faculties as follows:

ii- Fakulti of Education

iii- Faculty of Chemical and Natural Resources Engineering (for MRU & GASTEG laboratories only)

The five (5) steps of the Value Management Job Plan described in Figure 1.0 was implemented in a simplified workshop format as shown in Figure 4.0 below.

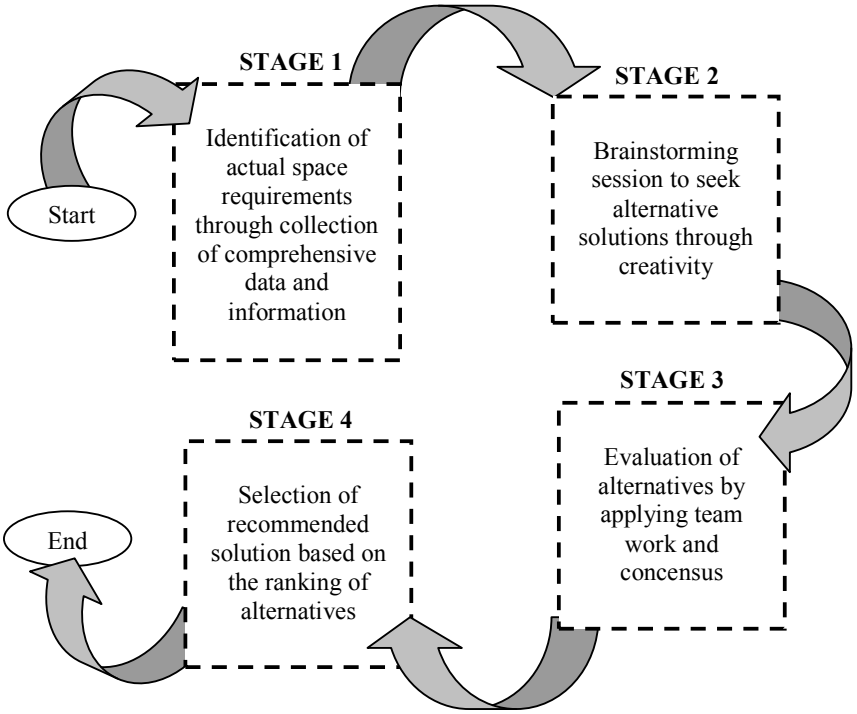


Figure 4.0 - Simplified VM Job Plan for workshop as applied in UTM

5.0 CASE STUDY

The Value Management methodology was used in finding alternatives and selection of the appropriate solutions to address new space requirements in UTM. Emphasis were given to consider the wide range of influencing factors and parameters and defining critically and accurately the real needs of the faculties. The value management workshops has helped the faculty members to discuss and analyze the issues comprehensively as a team enabling them to achieve consensus quickly. Among the challenging but critical stages of the workshop were:-

1. Space Function Analysis that provided clear definition and purpose of space required linked to objectives of the faculties and work process. Actual floor area requirements were obtained based on actual work areas required.

2. Creativity session to generate ideas on all possible ways and strategies to provide space and even considered means to improve work processes and management structure.

3. Using the Evaluation Matrix to define and rank criteria to evaluate the alternative solutions proposed by the workshop members. This gave very clear justifications on the selection of the final solution and helped tremendously in achieving consensus.

5.1 Case Study 1

Membrane Research Unit **(MRU) &** ***Gas Technology Center*** **(Gasteg),** Faculty of Chemical and Natural Resources Engineering

5.1.1 Need Statement

To provide adequate space and facilities to enable the enhancement and development of Gasteg and MRU to achieve international recognition and providing consultation services in R&D which contribute significantly to the achievement faculty strategic planning.

5.1.2 Background

Membrane Research Unit (MRU) and *Gas Technology Center* (Gasteg) of Faculty of Chemical and Natural Resources Engineering (FKKKSA) have laboratories which are located in the same building.

The MRU and Gasteg laboratories are used to teach students and conduct experiments as well as provide facilities for research works. Both units receive many R&D contracts from the industries.

Issues being faced by both units in their laboratories were :-

- Sharing facilities with undergraduate program which have different priorities and management procedures.
- Insufficient space to accommodate the increasing activities and amount of equipment and materials used in the laboratories.
- Improper and inadequate facilities and provision for safety and security.
- Unable to expand on research work.
- Negative image and impression to industrial clients visiting the laboratories.

After a preliminary discussion session with the heads of the laboratories and a half day visit and inspection to both laboratories to understand their operations and basic facts and information gathering process, a one day intensive value management workshop was done involving all the relevant staffs of the laboratories.

5.1.3 Alternatives

Based on early preliminary discussion with the faculty's management, two alternatives were proposed to manage the issues and meet the need statement mentioned above as follows:

a) Renovate and upgrade existing laboratories by providing improved and added facilities and building services. Significant changes would have to be done to the layout of equipments and circulation system within the laboratories and might require additional spaces to be provided as annexes to existing building. Management system and scheduling of activities would also require some changes.

b) Provide new building to house the laboratories.

5.1.4 Recommendations

The workshop successfully worked out an approximate 40% savings to the original proposal and request made by the faculty's management.

Comparison between the original request by the faculty and the proposed final solution obtained through the VM Workshop is shown below:

Laboratories	Original Request (sq. ft)	Cost of original request (RM)	After VM application (sq. ft)	Cost after VM (RM)
MRU @ RM150/sq.ft.	17,350	2,602,500.00	10,455	1,568,250.00
Gasteg @ RM120/sq.ft.	19,500	2,340,000.00	11,672	1,401,000.00
Total	36,850	4,942,500.00	22,130	2,969,250.00

Table 1.0 - Improved Solution For MRU And Gasteg Space Requirements After Applying VM Methodology.

The workshop was able to purpose a solution with approximately 40% savings in the cost. The faculty was also able to decide on the location of the new building within their existing complex area with ease.

5.2 Case Study 2
Fakulty of Education

5.2.1 Need Statement

To provide upgraded and additional spaces to comply with the *Quality Assurance (QA)* requirements as part of the faculty's strategy to improve their ranking by LAN (Lembaga Akredetasi Negara) and attract the Ministry of Education to continue doing more teachers training programs with them.

5.2.2 Background

- Fakulty of Education has no complex of it's own and has to operate in scattered spaces within the Faculty of Science complex.
- Inadequate space and facilities to comply with the requirements of QA (*Quality Assurance*) and OSHA.
- Unable to expand their teaching programs to incorporate new fields and accommodate larger number of students.
- Difficulties in providing facilities to incorporate new teaching techniques.
- Application for a new faculty complex in the Eighth Malaysian Plan (RM ke8) was not approved. Prospect of approval in the Ninth Malaysian Plan (RM ke9) also seemed unlikely.

5.2.3 Alternatives

A total of eight days were required to go through the VM Job Plan involving five major departments of the faculty. The value management workshop finally produced two possible solutions to be considered. This is shown in the table 2.0 below with comparison to the original budget application submitted for the Ninth Malaysian Plan done the normal way without applying the VM method.

Alternatives	**Floor Area (ft.sq.)**	**Cost (RM)**
New faculty complex as originally requested by faculty (Ninth Malaysian Plan estimate)	283,300 @ RM150/ft.sq	**42,495,000.00**
New faculty complex (estimate through VM methodology)	236,873 @ RM150/ft.sq.	**35,530,950.00**
Renovate and upgrade part of existing faculty's space and relocate significant part of faculty's facilities into students' hostel buildings located near the recreational zone of the campus.	145,272 @ RM50/ft.sq.	**7,263,600.00**

Table 2.0 - Outstanding Savings And Creative Solution After Applying VM Methodology In The Planning Of Space Requirements For Faculty Of Education.

The creativity session had proven to be very successful in opening up the possibilities of solutions to the faculty's space requirement and not limited them to the normal conventional option of just upgrading existing space or building a new building / complex. The option of relocating part of the faculty's facilities into students' hostel buildings offered a tremendous savings of approximately 70% compared to the proposal submitted for the Ninth Malaysian Plan budget. Further to this, the spaces released by Fakulti Pendidikan could be used by Fakulti Sains for their expansion and improvement.

5.2.4 Revision to Recommendations

The issue of difficulties in placing graduate teachers from universities raised in late 2005 however put a stop to the execution of the recommended solution described above. It was a reasonably easy and straight forward task for the faculty to revise their space planning by referring to the VM workshop report and recommended back to the university a much reduced and simplified scope of works to address the new development. This is another aspect of the success and advantage of applying the VM method in space planning where revision could be done effectively and efficiently when the need arise.

6. CONCLUSIONS

To date, Value Management has provided an effective way to deliver objectives and fulfill user's requirements. The system based functional analysis of Value Management allows consideration of complex interrelationships. Consequently, Value Management has a broad range of applications, with principle opportunity of gains in the early stages of development of programs and projects. It is particularly useful in focusing or distilling objectives and priorities, and in generating alternative solutions.

Value Management can provide considerable benefits to organizations in integrating the space requirement planning during design development. This is achieved through multidisciplinary and team oriented approach by all managers from cross functional and operational boundaries to deal with user's and stakeholders' requirements. The application varies in intent and outcome depending on the timing within the delivery or resolution process. As such Value Management provides an efficient and effective delivery system.

Both case studies described above have shown that Value Management is an effective tool in the planning of space requirement. There are clear and obvious impact and advantages gained in applying the concept of Value Management in the planning of space as follows:

- Cost effective – able to provide large savings through defining real requirements and avoid or minimize wastage or irrelevant elements.
- Systematic and comprehensive process.
- Able to provide solutions in a short time compared to conventional process requiring time to gather information and integrate requirements from various parties.
- Able to take into consideration all interests and long term requirements.
- Clear justifications on selection of solution which enable efficient process of modification or revision of solution if the need arise.

And indirect impact on the organization at the strategic level is the enhancement of teamwork qualities in the organization. This is possible through the extensive involvement of all parties and staff in the information gathering stage and intensive but systematic and creative nature of the "brainstorming" sessions in the VM Workshops.

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