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# VALUE AND RISK MANAGEMENT PROTOCOL FOR DYNAMIC BRIEF DEVELOPMENT IN CONSTRUCTION

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النظريات الحالية لعملية استخلاص متطلبات المشروع تحدد تطوير هذه المتطلبات الي مرحلة معينة. هذا المنظور يعوق التفاعل بين المالك و المصمم، كما يمنع الاستفادة من فرص القيمة التي قد تؤدي الي تحسين أداء المشروع. مبدأ التطوير الديناميكي لمتطلبات المشروع تم تقديمه كمدخل للتغلب علي قصور النظريات الحالية. هذا المبدأ يدعم و يشجع تطويرهذه المتطلبات طوال دورة حياة المشروع من أجل الوصول الي رضاء المالك والاستجابة لمحركات تطوير متطلبات المشروع والارتقاء بعملية استخلاص تلك المتطلبات و ادارة الأوامر التغييرية بشكل فعال. نظراً لأن السماح بتطوير المتطلبات طوال دورة حياة المشروع قد يساعد في اضافة إما قيمة أو مخاطرة أو كليهما للمشروع، فإن إدارة القيمة و إدارة المخاطرة تعتبران أكثر الوسائل المناسبة لإدارة التطوير الديناميكي لمتطلبات المشروع. بسبب مزايا عملية دمجهما، حيث أن الحصول علي قيمة أفضل لن يتم إلا تم ادارة المخاطر المصاحبة، فإن هذين المنهجين تم دمجهما لتشكيل بروتوكول ادارة القيمة و المخاطرة. هذه الورقة البحثية تهدف الي وضع القوانين، و إقامة الأسس لادارة و ضبط التطوير الديناميكي لمتطلبات المشروع، و تقديم وسيلة مبتكرة و جديدة لصناعة القرار، تم تطويرها بواسطة المؤلف، لتمكين الملاك و المشتغلين بصناعة الانشاءات من الوصول الي قرار مناسب لتطوير متطلبات المشروع.

The current briefing theories confine brief development to a certain stage. This perspective hinders the interaction between the client and the designer and inhibits utilising value opportunities that may enhance the project performance. The Dynamic Brief Development (DBD) concept is presented as an approach to overcome the limitations of the current briefing approaches. This concept supports and encourages brief development throughout the project life cycle in order to achieve client satisfaction, respond to the brief development drivers, improve the briefing process, and manage change orders effectively. Since permitting brief development to take place throughout the project life cycle can add either value or risk or both to the project, Value Management and Risk Management were the most appropriate tools to manage dynamic brief development. Because of the benefits of their integration, as better values could not be achieved unless associated risks have been managed, the two methodologies were integrated to formulate the Value and Risk Management Protocol (VRMP). This paper aims to set the rules and establish the grounds that manage and control dynamic brief development and presents an innovative decision making tool, developed by the author, to enable clients and construction professionals reach an appropriate brief development decision.

## 1. INTRODUCTION

Achieving client satisfaction was identified as one of the most significant issues facing today's construction industry. This perspective stems from the important role played by clients as the core of the construction industry and the driving force for improvement [1,2]. The briefing process is defined as the process running throughout the construction project by which means the project requirements are progressively captured and translated into effect [3]. Because of its pivotal role in eliciting and communicating clients' requirements to the design and construction teams, the briefing process is a cornerstone for achieving client satisfaction. Hence, it has to be flexible, well organised, and responsive to the client requirements [4,5].

Formal observations, literature review, analysis of 36 case studies, documentary data and unstructured interviews with projects' architects undertaken by the author showed that very few buildings are finished on time, or at the right cost and clients often blame the construction industry of providing products that do not achieve their requirements and meet their expectations. Furthermore, clients articulated that they used change orders to achieve their expected requirements and to adapt to the influence of the internal and external brief development drivers. This is attributed to the limitations of the current briefing approaches, which confine the development of the

project brief to a certain stage. This perspective hinders the interaction between the client and the designer and impedes exploiting value opportunities and managing risk threats caused by brief development drivers. In order to overcome the limitations of the current briefing approaches, the Dynamic Brief Development (DBD) concept was developed. This concept supports and encourages brief development throughout the project life cycle as an approach to achieve client satisfaction and respond in an innovative manner to the brief development drivers, improve the briefing process, and to manage change orders effectively [6].

Permitting brief development to take place without establishing the procedures that control its development leaves the project brief uncontrolled and jeopardise achieving client's satisfaction. Because brief development can add value or risk to the project or could add both, the well-established methodologies of Value Management (VM) and Risk Management (RM) are the most appropriate tools to manage dynamic brief development. Since better value could not be achieved unless associated risks have been managed, both methodologies have been integrated to formulate the Value and Risk Management Protocol (VRMP), which will be used to manage dynamic brief development in construction.

This paper aims to establish the basis and set the rules for this approach, and develop the tool that will manage and control dynamic brief development. Two objectives were developed to achieve this aim. The first one is theoretical, which focused on examining the role of VM and RM in managing dynamic brief development. The second objective is practical which presents an innovative decision making tool, developed by the author that will be used in the process of making an appropriate brief development decision.

## 2. VALUE MANAGEMENT FOR MANAGING DYNAMIC BRIEF DEVELOPMENT

VM has been defined as a systematic, multi-disciplinary effort directed towards analysing the functions of projects for the purpose of achieving the best value at the lowest overall life cycle cost [7]. The use of VM in construction projects is steadily increasing as clients seek better outcomes from their investment in building and structure. Some clients include the requirements for VM workshop in building contracts, as a way of ensuring optimal solutions. VM is a fundamental tool that brings together a range of project stakeholders in the VM workshops, where different views can be debated, and problems could be avoided [8]. VM as a structured approach with its powerful philosophy and approach plays an important role in managing dynamic brief development for the following reasons.

1. VM is a totally client driven technique oriented towards understanding client objectives, value systems, business case, and presenting better ways of providing the same performance at overall lower cost [9].
2. The fruitful diversity of VM workshop team members can help achieve successful results and ensures that stakeholders' views, objectives and requirements are perceived and reflected in the brief development decision as well as gaining their commitment to implement the selected decision.
3. VM is based on systematic steps, which ensures that the problem is thoroughly studied, innovative alternatives are generated and evaluated, and best alternatives are selected. In addition, following up and monitoring the implementation process can improve the briefing process through learned lessons and feedback.
4. VM has different chances to be applied in order to achieve emerging client requirements and can adapt to the influence of the brief development drivers. These chances are at: conception formulation, sketch design, working drawings, construction, and operation stages [10].
5. Using VM for identifying client requirements at the early stages of the project and responding to the brief development drivers can reduce later change orders and manage them for the benefit of the client.
6. Applying Value Engineering during the construction and operation stages is recommended and considered as fruitful area for applying VM as a large potential saving could be gained [10].

## 3. RISK MANAGEMENT FOR MANAGING DYNAMIC BRIEF DEVELOPMENT

The growing interest in RM in the UK construction industry produced a multitude of frameworks and risk analysis software packages being available to the project management practitioner [11-14]. This is because the construction industry is recognised as a high-risk industry. RM is also increasingly popular because it can provide value for money[15,16]. In addition, Latham[1] highlighted the need for risk assessment to be carried out at important stages of the construction process. Because of the dynamic nature of clients and the different internal and external brief development drivers, RM should be seen as a continuing activity throughout the project life cycle[17]. RM is an appropriate tool to manage dynamic brief development for the following reasons.

1. RM is a well-established technique directed towards identifying, analysing and responding to the different risks that affect and hinder the achievement of clients' objectives.
2. RM enables project stakeholders decide if the potential benefits associated with a particular course of action are sufficient to warrant accepting associated risks and safeguards the sponsor's interest when a course of action is been selected[18].

3. RM plays an important role in ensuring that best value for money is achieved since reducing risk means adding value [15].
4. Edwards and Bowen[19] stated that risks are dynamic and change during most projects therefore; RM should be an ongoing activity throughout the project life cycle to meet client expectations and enhance project performance.
5. The systematic steps of RM help reasoning and adopting the appropriate alternative, where feedback and learned lessons help improving the briefing process.
6. RM plays a pivotal role in managing change orders in construction through studying the effects of associated risks on the project. Then change orders with beneficial effects, that have an acceptable risk could be approved, where as downside change orders with unacceptable risks could be avoided[17].

## 4. THE ARGUMENT FOR INTEGRATING VM AND RM

VM and RM have become increasingly popular among project management practitioners. It is argued that best value for money can be achieved either by enhancing the requirements of a project, or by reducing the cost of meeting them. The search for value for money is trying to find the best balance between meeting stakeholders' requirements and the resources available. Finding this balance will inevitably involve some risks that have to be identified and assessed [15]. RM can achieve cost saving and enhance project value through identifying, assessing and responding to the risks associated with VM alternatives. RM and VM appear to be compatible and complementary and therefore it is logical to argue that the potential for a common framework should be investigated [19]. RM could be enhanced by using the VM team to audit, produce project's RM plan and generate alternatives to mitigating recognised risks. In addition, VM could be enhanced by improving the awareness of the potential risks of alternative proposals [7].

## 5. THE VALUE AND RISK MANAGEMENT PROTOCOL (VRMP)

Protocol was defined as the rigid code of etiquette prescribing the forms and procedures for various ceremonies and social functions in government, military, and diplomatic circles[20]. The Value and Risk Management Protocol (VRMP) is the representation of the proposed framework for managing and controlling brief development in construction. It is intended to utilize value opportunities and manage associated risks for the benefit of the client. It describes the functions, activities, tools and techniques required to enable clients and construction professionals adopt the appropriate brief development decision. The VRMP is an innovative tool utilised the integration of VM and RM to manage dynamic brief development for the first time in construction. The developed protocol overcame the pitfalls and shortcomings of the existing approaches for integrating value and risk management as well as managing change orders, and it represented a real contribution to the original body of knowledge. The protocol is more comprehensive than the normal application of Value Engineering (VE). This is because the protocol encompasses a set of systematic and logical procedures to enhance the value of the facility throughout the project life cycle. The VRMP embraces the whole value process, which includes Value Planning, Value Engineering, and Value Reviewing. In addition, it integrates VM with RM and took the advantage of their ability to provide better value and manage associated risks [22].

### 5.1 The Need, Aims and Objectives of VRMP

The need for the new approach stems from the necessity to overcome the limitations of the current briefing theories to achieve client satisfaction [6,23,24]. The VRMP is a decision making tool that aims to:

1. Enable clients and construction professionals adopt the appropriate brief development decision based on value addition and risk management,
2. Respond in an innovative manner to the influence of the different brief development drivers,
3. Manage project change orders effectively, and
4. Improve the briefing process through feedback and learned lessons.

These aims can be achieved through a set of interrelated objectives of:

1. Adequate identification of brief development problem,
2. Better understanding of the client objectives,
3. Generating, evaluating and selecting the optimal alternative,
4. Implementing the selected alternative, monitoring its execution and feedback the client and construction professionals with comments and learned lessons.

### 5.2 The Conceptual Description of the Protocol

The VRMP encompasses a methodology for systematic, gradual and teamwork of client and construction professionals to adopt the appropriate brief development decision. The VRMP is based on the systematic steps of the decision making process. These steps consist of three basic phases: (1) Intelligence phase, (2) Design Phase, and (3) Choice Phase[25]. In addition, the Simple Multi Attribute Rating Technique (SMART) was used to formulate part of the VRMP [26].

**The Pre-Study Phase: (Intelligence Phase)**

This phase aims to clearly identify the brief development problem by:

- Assembling and empowering the team,
- Investigating brief development data, and

- Defining brief development.

**The Study Phase: (Design Phase)**

This phase aims to structure the development objectives and scrutinise alternative solutions by:

- Defining objectives,
- Developing objectives value hierarchy,
- Allocating importance weight,
- Defining associated risks,
- Generating alternatives, and
- Evaluating alternatives.

**The Post-Study Phase: (Choice Phase)**

This phase aims to ensure that the developed alternatives are presented, the best one is selected, implemented and monitored and the client, design and construction teams received feedback with comments and learned lessons in order to improve the briefing process for future project by:

- Presenting alternatives,
- Selecting the best alternatives,
- Implementing the selected alternative, and
- Monitoring and feedback.

### 5.3 Modelling the Value and Risk Management Protocol

Modelling provides a powerful framework to formulate and solve engineering problems. It can systematise the everyday administrative and contingency procedures that do not go as planned[25] Managing Brief Development is a multi-disciplinary process, performed in a series of interrelated steps in order to enable clients and construction professionals adopt the appropriate brief development decision that utilise value opportunities and manage associated risk to meet client's requirements and achieve his satisfaction. If the procedures to manage brief development cannot be reduced to the activities of a simple model then they could lead to complications. Modelling the VRMP will facilitate effective management of dynamic brief development, diminish confusion, lessen personality conflict, maintain focus on project completion and achieve better decisions. Modelling requires determining the events that must take place, ascertaining their sequential relationship and presenting this information in a network. Based on the characteristics of the VRMP, the process model was considered to be the appropriate model to represent the activities that are being proposed to manage brief development because it is concerned with representing consecutive steps or activities with an end product or service being delivered. The following section will describe the Integrated DEFinition (IDEF-0), the selected modelling methodology.

**IDEF-0 Notation**

IDEF-0 is a modelling technique based on the Structured Analysis and Design Technique (SADT), a graphical approach to system description developed by Douglas T. McGowan and SofTech, Inc. in the 1970. Since then SADT has been refined and used for solving a variety of problems. In 1981, the US Air Force Programme for Integrated Computer-Aided Manufacturing (ICAM) standardised and made public a number of IDEF (Integrated DEFinition language) modelling techniques. These comprised: IDEF0, which used to produce a functional model; IDEF1, which used to produce information model and IDEF2, which used to produce a dynamic model. Of these three, IDEF-0 is the most used for modelling manufacturing and services processes and in business process reengineering tools [27,28].

IDEF-0 models are composed of three types of information: graphic diagrams, text, and glossary, which are cross-referenced to each other. The graphic diagrams are the major component of the IDEF-0 model, containing boxes, arrows, box/arrow interactions and associated relationships. A box represents a major function of a subject. These functions are composed into more detailed diagrams, until the subject is described at a level necessary to support the goals of the project. The top-level diagram in the model provides the most general description of the subject and is followed by a series of child diagrams providing more detail about the subject. Arrows show the flow of products including data between functions [28]. The kinds of arrows used in IDEF-0, and their relationship within a box, are illustrated in Figure 1. These include Input, Control, Output, Mechanism (ICOM), mechanism call, tunnelled, internal and boundary, and boundary arrows[29].

IDEF-0 is the most appropriate methodology to represent the VRMP because:

- It deals with functional / activity modelling, which is most appropriate since the objective is to describe the functions and activities of the proposed VRMP.
- It facilitates the development of a comprehensive model due to the elaborated information required to perform a function or activity.
- It is relatively easy to use and understand, and it has been proven to be suitable for use in construction [30].
- It provides a mechanism for decomposing a function into a number of smaller sub-functions and verifies that the inputs and outputs of the function match those of its sub-functions [31].

### 5.4 The Contents of the Protocol

The contents of the protocol are shown in Table 1. They are: identifying problem (VRMP/A1), structuring objectives (VRMP/A2), scrutinising alternative solutions (VRMP/A3) and adopting development decision (VRMP/A4), shown in Figure 2. A top level (VRMP / A-0) presentation of the protocol is presented in Figure 3.

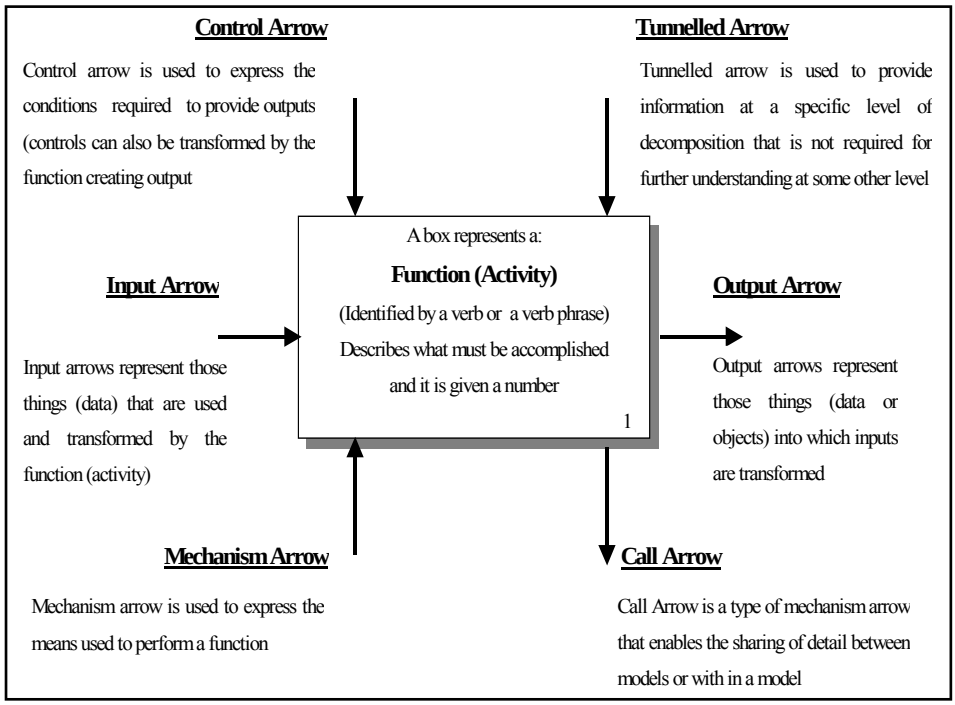


Figure 1: Basic Concepts of the IDEF-0 Method

Table 1. Table of Contents of the VRMP

| Diagram Reference | | | Description |
|---|---|---|---|
| VRMP/A0 | | | Managing Construction Brief Development |
| VRMP/A1 | | | Identifying Problem |
| | A11 | | Assembling and Empowering the team |
| | | A111 | Orientation Meeting |
| | | A112 | Identifying and Selecting the team members |
| | | A113 | Deciding on study date, time, duration, location |
| | A12 | | Investigating Brief Development Data |
| | | A121 | Collecting Brief Development Data |
| | | A122 | Defining Development Data Resources |
| | | A123 | Classifying Development Data |
| | A13 | | Defining Brief Development |
| | | A131 | Describing Brief Development |
| | | A132 | Defining Development Driver |
| | | A133 | Defining Development Stage |
| | | A134 | Defining Development Initiator |
| | | A135 | Defining Value & Risk Sources to Client |
| VRMP/A2 | | | Structuring Objectives |
| | A21 | | Defining Objectives |
| | A22 | | Developing Objectives Value Hierarchy |
| | A23 | | Allocating Importance Weights |
| | A24 | | Defining Associated Risks |
| VRMP/A3 | | | Scrutinising Alternative Solutions |
| | A31 | | Generating Alternatives |
| | A32 | | Evaluating Alternatives |
| | | A321 | Developing Decision Matrix |
| | | A322 | Assessing Associated Risks |
| | | A323 | Comparing Alternatives |
| | | A324 | Performing Sensitivity Analysis |
| | | A325 | Reconciling Value and Risk |
| VRMP/A4 | | | Adopting Development Decision |
| | A41 | | PRESENTING ALTERNATIVES |
| | A42 | | Selecting the Best Alternative |
| | A43 | | Implementing the Selected Alternative |
| | A44 | | Monitoring and Feeding back |

### *Identifying Problem*

The "Identifying Problem" function (Figure 4) is a decomposition of box 1 in the VRMP/A0 diagram (Figure 2) and it involves three activities: 1) Assembling and Empowering the Team, 2) Investigating Brief Development Data, and 3) Defining Brief Development.

### Assembling and Empowering the Team

It is important to have an orientation meeting prior to the study in order to understand the client's objectives and identify the reasons that drive the brief development. Logistical matters such as selecting team members, study date, time, duration and location can be decided. The correct team selection with members with various areas of expertise is critical to the success of brief development study. The valuable background knowledge of clients and users representatives plays a vital role in assisting team members understand the project operations and development required. Teams ideally should contain between six and twelve full time participants to maintain optimum productivity [7].

### Investigating Brief Development Data

This activity aims to investigate brief development data. It focuses on collecting brief development data, defining development data resources and classifying development data. When a brief development request is raised by the client or any other concerned parties, it is important to authenticate these data. This will be done through collecting data from relevant parties and reliable sources and then data resources will be defined and the collected data will be classified.

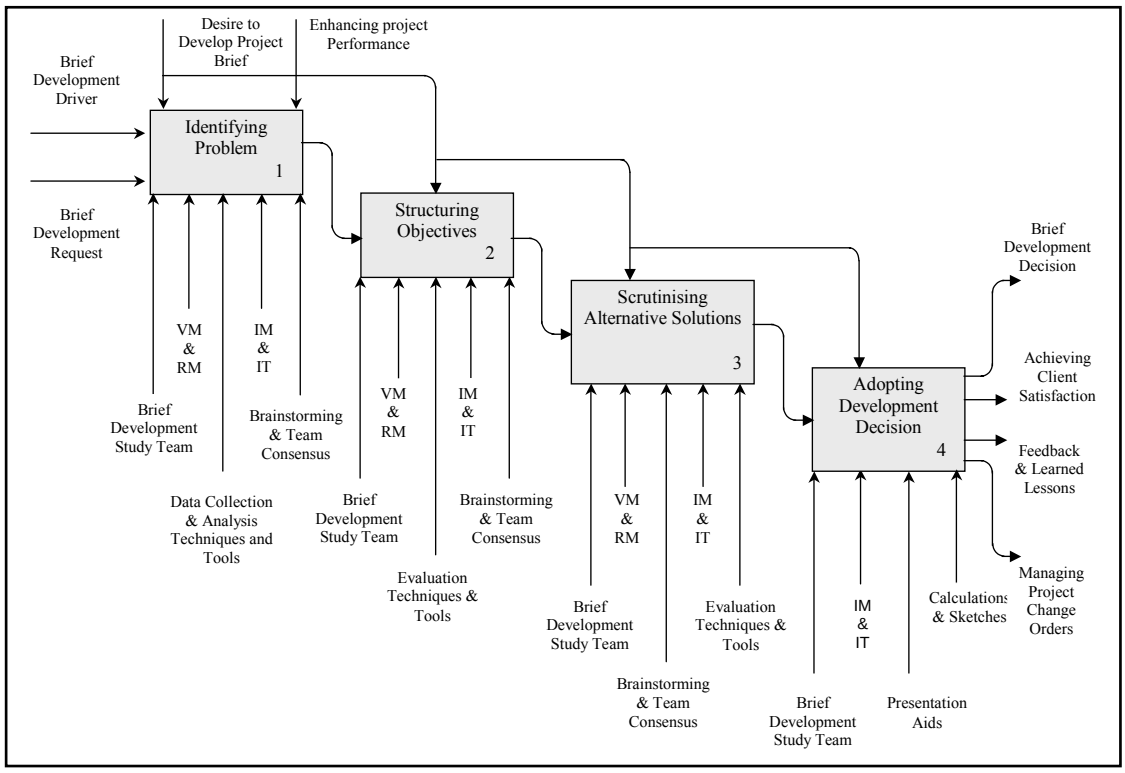


Figure 2: The Four Main Steps of the VRMP

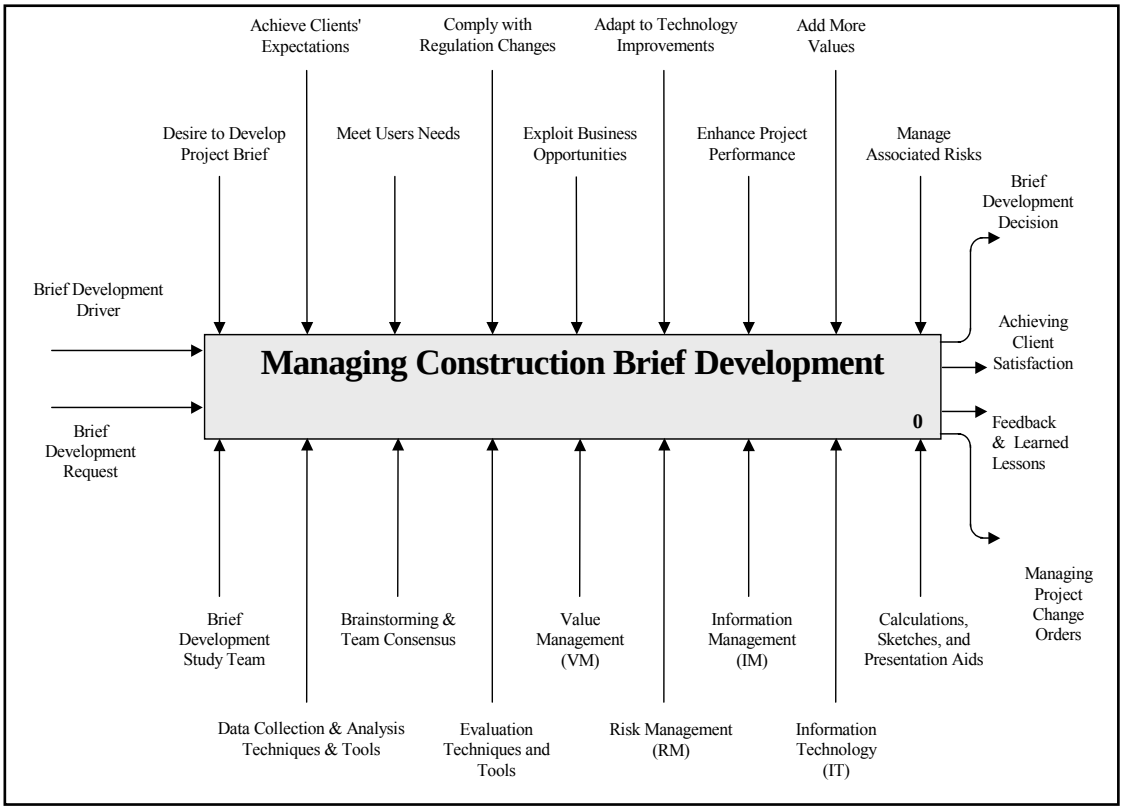


Figure 3: The Top-Level Diagram for the VRMP

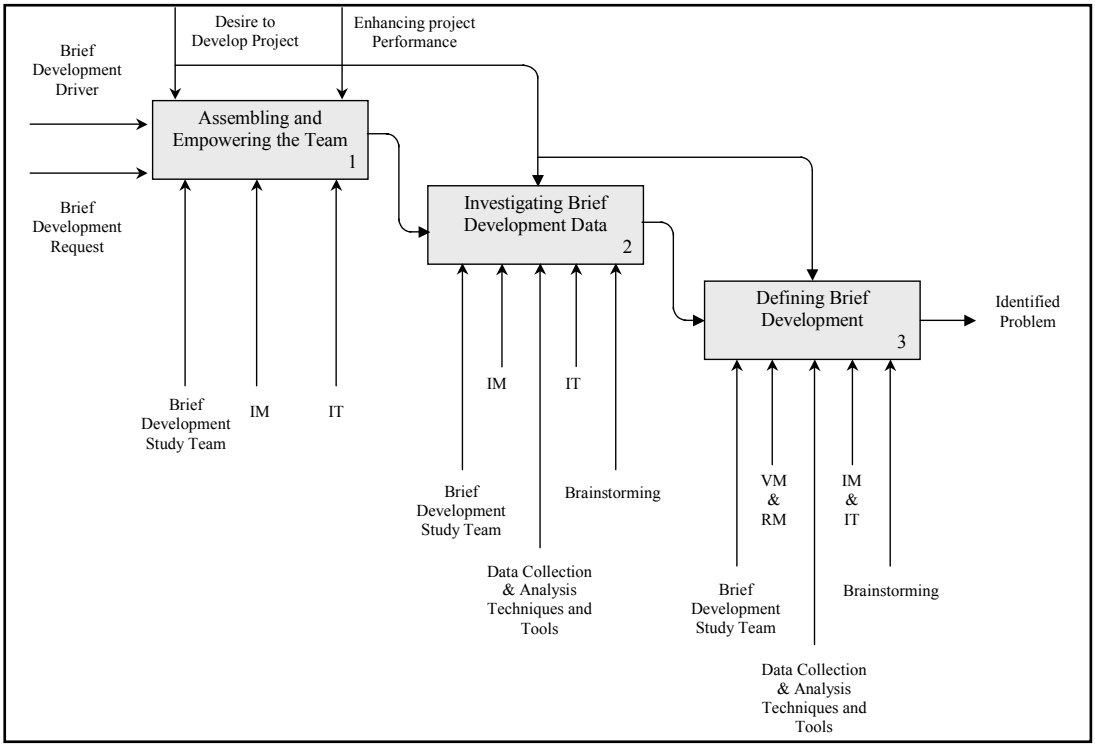


Figure 4: Identifying Problem

**Defining Brief Development**

This activity aims to describe brief development, define the development drivers, stages, initiators, value sources and risk sources to the client. This information is intended to enable the study team understand the development required.

***Structuring Objectives***

The "Structuring Objectives" function (Figure 5) is a decomposition of box 2 in the VRMP/A0 diagram (Figure 2) and it involves four activities: 1) defining objectives, 2) developing objectives value hierarchy, 3) allocating importance weight and 4) defining associated risks.

**Defining Objectives**

In order to enable clients and construction professionals adopt the appropriate decision, the objectives of brief development have to be adequately defined. Clear definition of objectives leads to the achievement of client satisfaction. The objective of this function can be adequately achieved through collecting data from the concerned parties and the use of brainstorming and team consensus.

**Developing Objectives Value Hierarchy**

This activity aims to structure the brief development objectives in a value tree to allocate importance weights in subsequent stage. The top of the tree is characterised by the overriding cause of the entire objectives. This is then progressively broken down into sub-objectives. Whilst the higher order objective represents an end in itself, the lower order objectives are considered to be a 'means-to-an-end'. It is important that the value tree is produced by brainstorming and group consensus and that each participant feels involved.

**Allocating Importance Weights**

It is essential after the objectives value hierarchy is developed to allocate importance weights to each attribute according to its perceived importance.

- Attributes are initially listed in order to perceived importance and the least importance is awarded an arbitrary weight of 10.
- It is then necessary to allocate weights to the other attributes on the basis of their relative importance.
- The weights are then summed and each attribute is normalised so that the total weight for the group adds up to 1.

**Defining Associated Risks**

Since better value is not likely to be achieved unless associated risk are identified, this function aims to define the different risks that lead to brief development or affect the achievement of development objectives.

***Scrutinising Alternative Solutions***

The "Scrutinising Alternative Solutions" function (Figure 6) is a decomposition of box 3 in the VRMP/A0 diagram (Figure 2) and it involves two activities: 1) Generating alternatives, and 2) Evaluating alternatives.

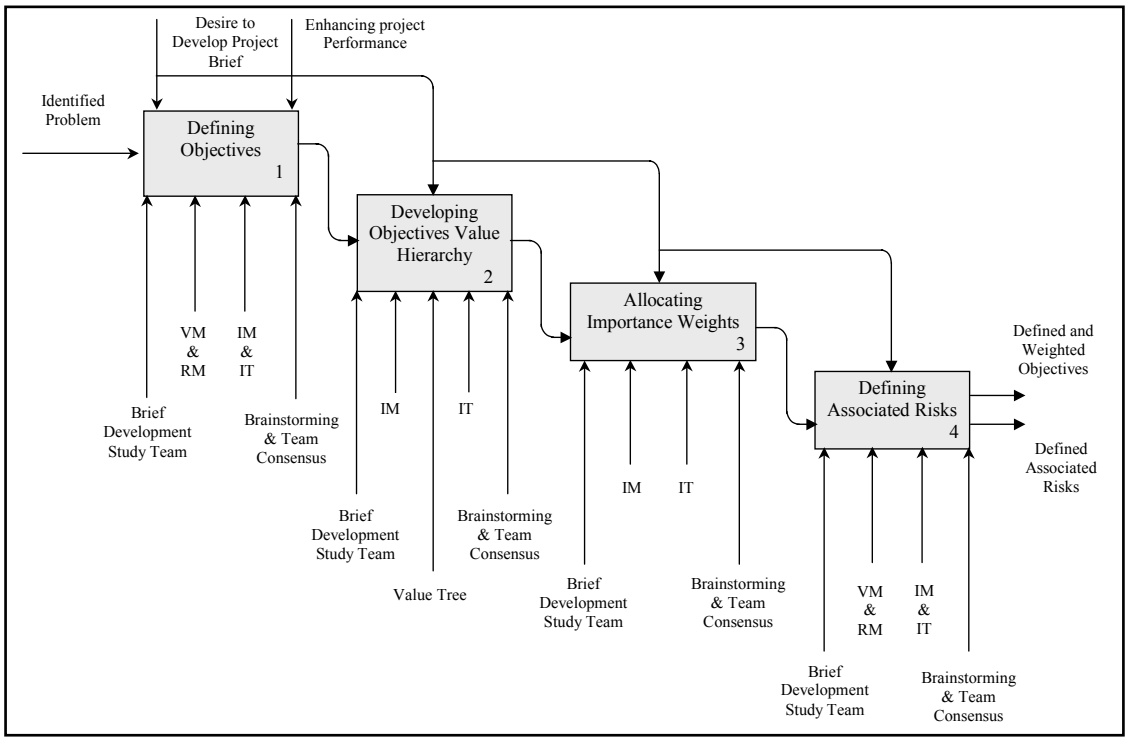


Figure 5: Structuring Objectives

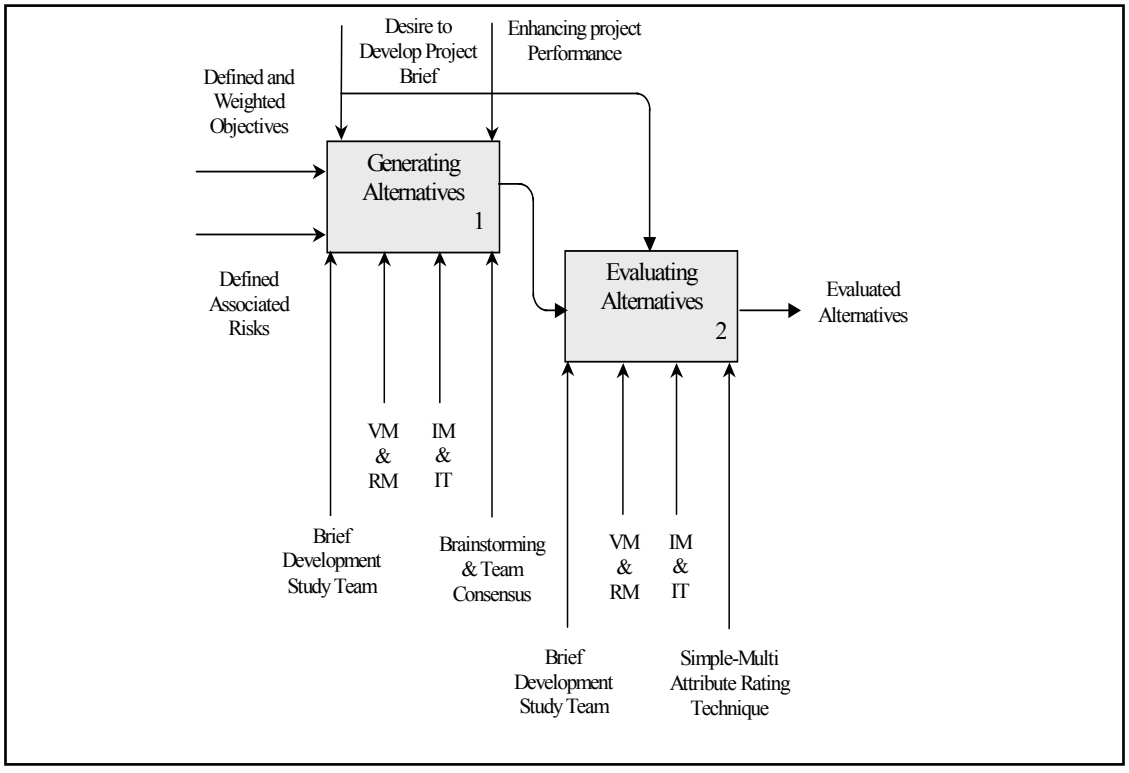


Figure 6: Scrutinising Alternative Solutions

**Generating Alternatives**

This function aims to create new ideas that achieve the various brief development objectives in the most cost effective manner. The brainstorming technique is used to generate and record a large number of ideas without evaluation.

**Evaluating Alternatives**

During this function the desire for the judgement of ideas, which was suppressed during the previous function, is applied. The allocation of importance weights to the objectives value hierarchy forms the basis of the evaluation process. Alternatives evaluation screens the ideas created, so that only the best ideas will be selected for development. Evaluation involves the following processes of:

- Developing a decision matrix,
- Assessing associated risks,
- Comparing alternatives,
- Performing sensitivity analysis, and
- Reconciling value and risk.

Firstly, each option is assessed against each of the identified attributes (i.e. objectives and sub-objectives). This is best done in the form of a decision matrix. Each brief development option is scored against each attribute on a scale from 0-100. Following the allocation of scores, these are then weighted (i.e. multiplied) by the appropriate importance weighting identified during the allocating importance weight function. The weighted scores for each attribute in brief development alternatives (i.e. alternative A) can then be added together to provide the aggregate score for brief development alternatives. By comparing the total scores of the various alternatives, the most suitable options can be arrived at with those that have the highest score [32]. Secondly, every alternative is assessed against the associated risks by assessing risk likelihood and severity. The assessed risk = Likelihood X Severity. Thirdly, all development alternatives are compared to each other on the basis of expected value and associated risks. The best alternative is the one, which has more net expected value (= expected value –associated risk). Fourthly, a sensitivity analysis has to be carried out. The purpose of this analysis is to test how sensitive the outcome of the rating process is to marginal changes in the key variables. Particular attention should be given to any importance weights which members of the team had expressed some discomfort. It may be necessary to adjust the structure of the value and risk tree[26]. Finally, it may be essential that the study team revisits the selected alternatives, in particular, when the associated risk (i.e. cost) is higher than the estimated cost. Minor modifications to the selected alternative can overcome this problem without affecting the overall performance.

***Adopting Development Decision***

The "Adopting Development Decision" function (Figure 7) is a decomposition of box 4 in the VRMP/A0 diagram (Figure 2) and it involves four activities: (1) Presenting alternatives, (2) Selecting best alternative, (3) Implementing selected alternatives, and (4) Monitoring and feedback.

**Presenting Alternatives and Selecting the Best Alternative**

The objective of the "Presenting Alternatives" function is to assist in the communication of the results from the brief development study to the decision makers. This function enables the study team to orally present their major recommendations so that the subsequent review of the written proposals is not hindered by a lack of understanding. During the "Selecting Best alternative" function the decision makers should select the most appropriate alternative that achieves client objectives and guarantees his/her satisfaction in the most cost-effective manner [7].

**Implementing the Selected Alternative**

If the decision-makers adopted the decision to proceed with brief development, the project manager with the collaboration of design and construction team has to establish the plans and procedures to implement this decision.

**Monitoring and Feedback**

This function plays an important role in following up and observing the implementation of the adopted decision. It aims to ensure that implementing the selected decision proceeds as planned and tries to take any corrective actions if any problems arise. In addition, it is necessary to make sure that the final product of brief development satisfies and achieves the client requirements. The "Feedback" function aims to improve the briefing process for future projects through feedback to the client and design and construction teams, learned lessons and comments of the facilities management team and end users.

## 6. APPLICATION OF THE VALUE AND RISK MANAGEMENT PROTOCOL

In order to investigate how the VRMP will be implemented in managing dynamic brief development, the protocol was applied on a number of real case studies in Abu Dhabi, the capital of the United Arab Emirates (UAE). These case studies were at different stages of the project life cycle. Details of a case study at the design stage are described below. Based on the client requirements, the project was designed as a residential building consists of:

- Ground floor (shops and services rooms),
- 4 typical floors (16 two bed rooms flats), and
- Roof floor (services rooms and watchman room).

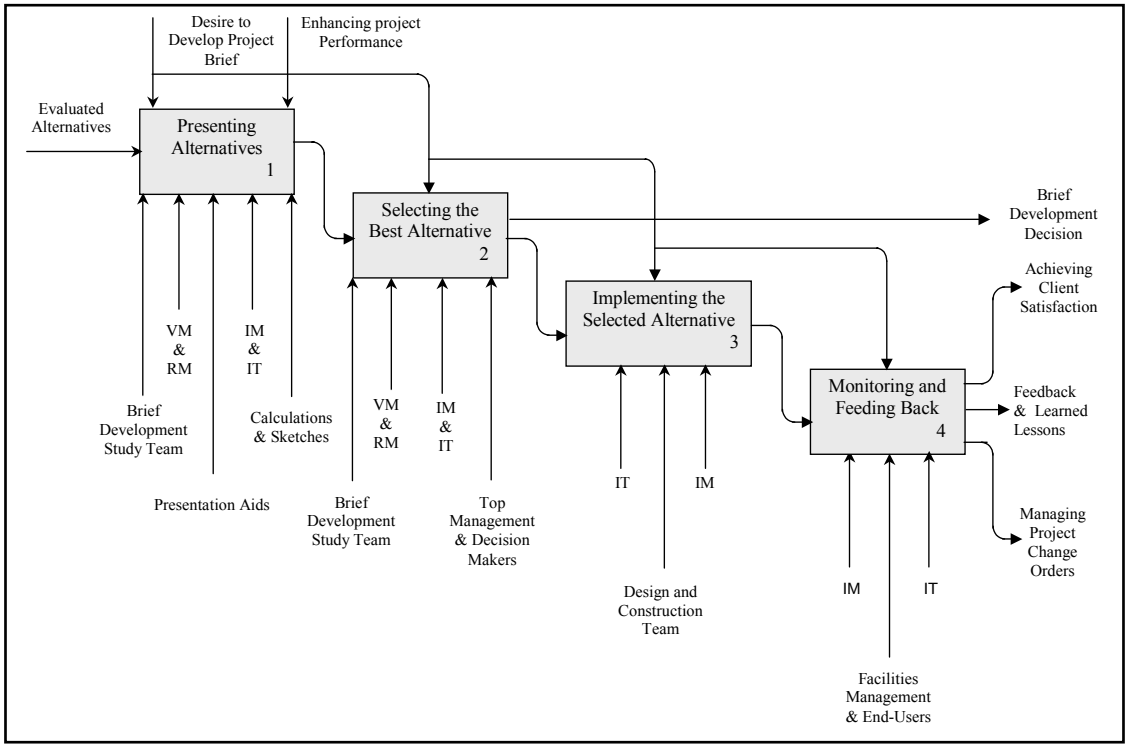


Figure 7: Adopting Development Decision

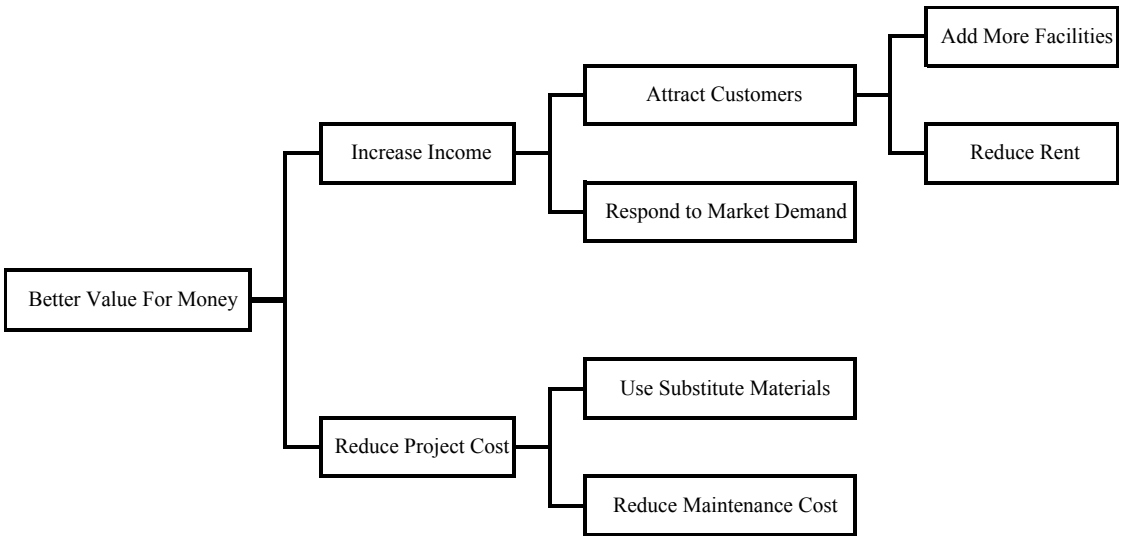


Figure 8: Brief Development Objectives Value Hierarchy

The project cost estimated to be DHS (Dirhams) 6, 000, 000 and the construction period was projected to be 12 months. At the tender action stage, the client received an offer to rent the building for 10 years if the design was changed to be an office building with no flats or shops. A request was submitted to the design firm and the funding authority that approves the design and supervises the construction work. It was made clear to the client that any changes to the project brief should be within the limit of the government loan to construct the building; otherwise the client has to provide additional funds to cover any extra cost. The client stated that he does not have the ability to provide additional funds and the modifications should not exceed the government loan. It worth to mention that the government loan is given to the UAE citizens as a way of providing social insurance and stable income to enable them meet the challenge of life, as well as save citizens from the high rates of the commercial banks. Once the building is handed over and occupied, the client will receive 30% of the building's revenues, where 60% of the building's revenues is allocated for reimbursing the government loan with no interest, and the remaining 10% will be kept for maintenance work[33].

An orientation meeting was attended by the client representative, project manager, chief architect and the author. The meeting aimed to discuss the client's request and understand his objectives and the reasons for modifying the project design and how his objectives could be achieved. A study team was formed from the author as a facilitator, client representative, project manager, architect, quantity surveyor, structural engineer, civil engineer, and electrical and mechanical engineer. The study period was 5 working days at the design firm. One week was given to the design firm to collect adequate information from related authorities and parties. Data were collected from the client, end user, Municipality and Town Planning Department, Civil Defence Directorate, Water and Electricity Department. The data collected from the first two sources focused on how the new design will meet their expectations and satisfy their needs, where the data collected from other sources was about the requirements and procedures for design change as well as how the new design will comply with government authorities' regulations.

The client's request was defined as modifying the project design from a residential building to be an office building with no flats or shops in order to get better value for money and utilize the benefits of the project location. The design team advised the client to include some flats and shops in the new design to utilize the increasing market demand for flats and shops. A set of sub objectives were generated to achieve the client objectives:

- increase income.
- respond to market demand.
- reduce project cost.
- reduce maintenance cost.
- attract customers.
- use substitute materials.

The brief development study team, who attended the brainstorming session, played an important role in developing the objectives value hierarchy and allocating importance weights for each objective based on the importance of the objective to the client (Figure 8 and Table 2). In addition, the brainstorming session was utilized to define the associated risks that may threaten the achievement of the client objectives. They were:

- Delay due to re-design time required and getting authorities approvals.
- Delay due to importing materials.
- Loss of customers.

Table 2. Importance Weights of the Brief Development Objectives

| Development Objectives | Weights | Normalised Importance Weight |
|---|---|---|
| Add More Facilities | 10.00 | 0.24 |
| Reduce Rent | 15.00 | 0.36 |
| Respond to Market Demand | 10.00 | 0.20 |
| Use Substitute Materials | 40.00 | 0.16 |
| Reduce Maintenance Cost | 10.00 | 0.04 |

Table 3. Brief Development Generated Alternative (A-G)

| | |
|---|---|
| A | Leave the design of the typical floors as it is, move the services rooms in the ground floor to basement in order to increase the showroom area, use substitute cheaper materials |
| B | Increase the number of flats from 16 (two bed room) to 24 (one bed room), move the services rooms to basement to increase showroom area, construct car parking at basement, raise the building specification, and reduce rent. |
| C | Re-design two floors to be offices, leave the other floors to be 8 flats (two bed room), move the services rooms to basement, construct car parking at basement, and use substitute cheaper materials. |
| D | Re-design two floors to be offices, re-design the other two floors to be 12 flats (one bed room) instead of 8 flats (two bed room), move the services rooms to basement, construct car parking at basement, and use substitute cheaper materials. |
| E | Modify the design of the whole project to be office building, move the services room in ground floor to basement and add car parking, and raise building specification to attract customers. |
| F | Modify the design of the whole project to be office building, move the services rooms in the ground floor to the basement and add car parking, and use substitute cheaper materials. |
| G | Invest the client resources in another type of project. |

Table 4. Decision Matrix Used to Evaluate Alternatives

| Assessment Attributes | Add More Facilities | Reduce Rent | Respond to Market Demand | Use Substitute Materials | Reduce Maintenance Cost | Total |
|---|---|---|---|---|---|---|
| Weights of Importance | 0.24 | 0.36 | 0.20 | 0.16 | 0.04 | |
| Alternative A | 0.00<br>0.00 | 0.00<br>0.00 | 20.00<br>4.00 | 100.00<br>16.00 | 0.00<br>0.00 | 20.00 |
| Alternative B | 75.00<br>18.00 | 25.00<br>9.00 | 30.00<br>6.00 | 0.00<br>0.00 | 0.00<br>0.00 | 33.00 |
| Alternative C | 50.00<br>12.00 | 0.00<br>0.00 | 40.00<br>8.00 | 100.00<br>16.00 | 42.00<br>1.68 | 37.68 |
| Alternative D | 50.00<br>12.00 | 0.00<br>0.00 | 50.00<br>10.00 | 100.00<br>16.00 | 40.00<br>1.60 | 39.60 |
| Alternative E | 75.00<br>18.00 | 0.00<br>0.00 | 80.00<br>16.00 | 0.00<br>0.00 | 85.00<br>3.40 | 37.40 |
| Alternative F | 50.00<br>12.00 | 0.00<br>0.00 | 80.00<br>16.00 | 100.00<br>16.00 | 85.00<br>3.40 | 47.40 |

Table 5. Assessing Associated Risks

| Assessment Attributes | Re-Design Delay | | Importing Materials | | Losing Customers | | Total |
|---|---|---|---|---|---|---|---|
| | L | S | L | S | L | S | |
| Alternative A | 5.00 | 1.00<br>5.00 | 1.00 | 1.00<br>1.00 | 2.00 | 2.00<br>4.00 | 10.00 |
| Alternative B | 5.00 | 3.00<br>15.00 | 3.00 | 3.00<br>9.00 | 1.00 | 1.00<br>1.00 | 25.00 |
| Alternative C | 5.00 | 2.00<br>10.00 | 1.00 | 1.00<br>1.00 | 1.00 | 1.00<br>1.00 | 12.00 |
| Alternative D | 5.00 | 2.00<br>10.00 | 1.00 | 1.00<br>1.00 | 1.00 | 1.00<br>1.00 | 12.00 |
| Alternative E | 5.00 | 2.00<br>10.00 | 4.00 | 3.00<br>12.00 | 1.00 | 1.00<br>1.00 | 23.00 |
| Alternative F | 5.00 | 2.00<br>10.00 | 1.00 | 1.00<br>1.00 | 1.00 | 1.00<br>1.00 | 12.00 |

Table 6. Comparing Alternatives

| | Expected Value | Associated Risk | Net Expected Value |
|---|---|---|---|
| A | 20.00 | 10.00 | 10.00 |
| B | 33.00 | 25.00 | 8.00 |
| C | 37.68 | 12.00 | 25.68 |
| D | 39.60 | 12.00 | 27.60 |
| E | 37.40 | 23.00 | 14.40 |
| F | 47.40 | 12.00 | 35.40 |

The multi-disciplinary study team used the brainstorming technique to generate creative alternatives to achieve the above objectives. Table 3 summarizes the generated alternatives. All participants were encouraged to generate as many ideas as they can. In addition, every participant was prompted to build on and improve ideas which may be generated by others team members.

After the previous stage was completed, the different generated alternatives were evaluated. Alternative "G" was rejected on the basis that the government loan given to the client was intended to be spent on constructing his building and not for any other purpose. Other alternatives were raised for evaluation. A decision matrix was created to evaluate each alternative against the pre-defined objectives, Table 4. Assessing associated risks plays an important role in identifying the risks that most threaten the achievement of the development objectives. This was done by assessing risk likelihood and severity, where assessed risk = likelihood (L) X Severity (S), Table 5. After the decision matrix was developed and the associated risks were assessed. Alternative were compared on the bases of net expected value and associated risks, where net expected value = (expected value-associated risk), Table 6. The weights mentioned in all tables represent the arithmetic means of the different weights proposed by the participant in the evaluation session.

Results of comparing alternatives showed that alternative "F" has the highest net expected value of 35.40. A sensitivity analysis was carried out by fixing all evaluation criteria and changing one criterion and then observing its effect on the evaluated alternatives. Results showed that alternative "F" was still the favored option.

A presentation meeting was held at the design firm office where a brief description of the study was introduced to the client. It included presentation of the VRMP, identifying the problem, structuring objectives, generating and evaluating alternatives. In addition, a brief development study report was submitted to the client in order to facilitate reviewing the systematic steps followed and helping adopt the brief development decision.

Alternative "F" was selected as the best alternative with net expected value of 35.40. The cost of the selected alternative was expected to be DHS 5,660,270, which was within the budget of the government loan. Then, an official letter was issued by the client and the funding authority to the design firm stating that acceptance of the changes of the project design and brief development had been agreed and that the design firm would be compensated for the re-design and production of tender documents as an office building. Accordingly, the design firm re-designed the project. The feed back of the case study can be summarized as:

1. Carrying out adequate study of the client business case, client requirements and market demand will avoid later changes where its cost can be expensive and it disrupts the scheduled works.
2. The designer should bear in mind that many clients do not have in depth construction knowledge or cannot describe what they need, so the designer should have developed the art of questioning client and be able to suggest more options until the client

requirements are met and his/her satisfaction is achieved.

3. Clients should provide the design firm with all information and open communication channels to reflect their requirements as early as possible.
4. The project was constructed and occupied and the client was satisfied with the results of the study.

## 7. BENEFITS OF THE VALUE AND RISK MANAGEMENT PROTOCOL

The main benefit of the VRMP is enabling clients and construction professionals adopt a process for brief development decision. It clarified client aims and objectives through the participation of project stakeholders and ensuring that client requirements were clearly defined. In addition, it helped identifying the detail for brief development required for creating a collaborative work environment. Furthermore, it suggested that better values were added through generating improved and cost-effective solutions that meet client expectations as well as minimising uncertainties through the identification, analysis and responding to associated risks. The protocol helped managing change orders effectively and enhancing the briefing process through learned lessons and feedback. It is clear that the VRMP represents an innovative approach to achieve client satisfaction, responding to brief development drivers throughout the project life cycle, managing project change orders effectively, and improving the existing briefing process.

## 8. LIMITATIONS OF THE VALUE AND RISK MANAGEMENT PROTOCOL

The effective application of the VRMP depends to a large extent on the client organisation and construction professionals. If they do not have the desire to use the protocol, then its adoption will be limited. In addition, the application of the protocol is time consuming, and within the current culture in the construction industry where insufficient time is spent on managing brief development, this protocol might not be welcomed by some sectors of the industry. Moreover, the large amount of information used to manage this form of brief development necessitates that it must be well managed. In order to overcome the limitations of the protocol and facilitate its use, the benefits of the protocol have to be clearly presented to the client organisation and construction professionals in order to get them convinced with the role, which the protocol could play in managing brief development. This will increase the opportunities for adopting the protocol. In addition, the benefits of information management and information technology have to be utilised to minimise the time required to apply the protocol and manage the large amount of information used. For this reason, the protocol is now captured in a computer software format, which will be presented in a subsequent paper.

## 9. CONCLUSIONS

- Limitations of the current briefing theories to achieve client satisfaction are attributed to confining brief development to a certain stage. This perspective hinders the interaction between the client and the designer and inhibits utilising value opportunities and manages associated risks. The Dynamic Brief Development (DBD) concept is presented as an approach to overcome the limitations of the current briefing approaches. This concept supports and encourages brief development throughout the project life cycle.
- Since permitting brief development to take place throughout the project life cycle can add either value or risk or both to the project, Value Management and Risk Management were integrates to formulate the Value and Risk Management Protocol.
- The Protocol is a decision making tool designed to manage dynamic brief development throughout the project life cycle. Its need was emerged from the necessity of the dynamic brief development concept. The protocol aimed to enable client's organisation and construction professionals adopt better brief development decision on the basis of value addition and risk management. In addition, it aimed to achieve client satisfaction, respond to the influences of the brief development drivers, manage project change orders effectively, and improve the performance of the briefing process through feedback and learned lessons.
- These aims were achieved through a set of interrelated objectives of: adequate identification of brief development problems, better understanding of the client objectives, generating, evaluating and selecting the best alternative that will achieve these objectives at the most cost - effective manner, and implementing the selected alternative, monitoring its execution and feedback the client organisation, design and construction teams with comments and learned lessons.
- The protocol based on systematic steps of decision-making consists of: 1) intelligent phase, 2) design phase, and 3) choice phase. In order to select the appropriate way to represent the protocol activities the IDEF-0 methodology was considered the most appropriate tool to represent the protocol. The rational behind its selection and description of its notation was illustrated.
- The protocol consisted of four steps: Identifying problem, structuring objectives, scrutinising alternative solutions, and adopting development decision. The protocol was applied on real case studies at different stages. A case study at the design stage was presented. Benefits of the Protocol were presented and limitations were explained which will be overcome through capturing the protocol in a computer software format.

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