THE NEED FOR VALUE MANAGEMENT IN THE DEVELOPMENT PROCESS OF CONSTRUCTION PROJECTS IN CHINA: A SYSTEMATIC PERSPECTIVE

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Abstract: This paper discusses the need for value management (VM) in the development process of construction projects in China from a systematic perspective. Following the clarification of the concept of value in the context of value management, this paper examines the value system of a construction project. After the introduction of ways to achieve value for money in construction, this paper investigates the deficiencies of current measures for ensuring value of construction projects in China. Based on the discussion of VM’s contribution to value improvement of construction projects, this paper argues that there is a strong need for VM in the development process of construction projects in China. The authors finally recommend six recommendation insert points for the implementation of VM in the process.

Keywords: China; Construction industry; Value for money; Value management

1 Introduction

Value management (VM) is a proactive, creative, systematic and team-oriented methodology that maximizes the functional value of a project by managing its development from concept to occupancy according to the value requirement of the client. It evolved from the traditional paradigm of value analysis (VA) and value engineering (VE). The evolution can be traced from typical definitions provided by Miles (1961), Zimmerman and Hart (1982) and Kelly and Male (1993). Whilst these definitions provide the differences between VM, VE and VA (as shown in Table 1), it is not correct to perceive them as three totally different processes. VM in construction is increasingly being seen as the term to describe the total process of enhancing value of a project for the client from concept to operation. VE and VA can be viewed as special cases of the generic discipline of VM, whose focus is on improving value in the design and construction stages of a project (Male et al., 1998). The evolution process also has been summarized by Dawson (2001) with five main changes of the value methodology: 1) from ‘process’ to ‘people’, 2) from remedial to preventative, 3) wider application of VM, 4) from one workshop to several workshops, and 5) from technical participants to executive participants.

VM was first introduced to the construction industry in the early 1960s by Dell’Isola. It has been successfully used in the construction industry in many countries in the past four decades. However, in China, although VM has been developed for more than 20 years, this method has seldom used in the development process of construction project (Shen & Liu, 2004). Before setting up strategies to promote VM applications, it is necessary to clearly investigate the need for VM in the development process of construction projects in China. From this angle, this paper clarifies the concept of value in the context of VM and identifies the value system of a construction project. Then, it summarises the way to ensure value for money and investigate current measures to ensure value of construction projects in China. Based on the investigation, the authors argue the need for VM and suggest the appreciate insert points in the development process of construction projects in China.

2 The term of value in the context of value management

It is widely believed that what has made VM differing from traditional cost control in that, rather than focusing on simple cost, it concentrates on achieving value for clients/users (Kelly and Male, 1988; Green and Popper, 1990; Shillito and Marle, 1992). Definitely, value is one of the most fundamental concepts in value techniques. However, value is a term with different interpretations within different situations. The following
Value has both objective and subjective qualities. It has been presented in terms of use, qualities which accomplish a use, work or service; esteem, features which make ownership of an object desirable; cost, the sum of the labour, material, overhead and other costs required to produce it; exchange, properties enabling us to exchange it (Mudge, 1976; SAVE International, 1998). It is also suggested that the definition of value is dependent on whether one is looking from the producer’s side or from the user’s side (Miles, 1961).

Miles (1989) stated “A product or service is generally considered to have good value if that product or service has appropriate performance and cost”. By this definition, he pointed out two ways to increase value by: 1) decreasing costs and maintaining performance; 2) increasing performance if the customer needed, wanted, and was willing to pay for more performance. He sequentially argued what the customer wants in products or services are functions. In this respect, Miles essentially considered value as the relationship between function and cost.

In volumes of VM literature, value is mathematically written as the ratio of function to cost (Equation 1), e.g. Burnside, 1964; Shillito and Marle, 1992; Maramaldo, 2000; Tan and Yang, 1996; etc.

\[
\text{value} = \frac{\text{function}}{\text{cost}}
\]  

\text{(Equation 1)}

Based on the above equation, value of a product or service could be theoretically increased either by: 1) increasing the function with the same cost; 2) decreasing the cost with the same function; 3) increasing the function with reduction of cost; 4) increasing the function significantly with slight addition of cost; and 5) decreasing the cost significantly with slight reduction of function. The equation only illustrates the relationship of value with cost and function, but cannot be really used to measure value due to the different unit of function and cost. Cost can often be measured by the monetary amount paid by the customer/user, but function is hard to measure objectively due to its inherent subjective quality as well as value.

Value has been closely associated with the user’s purpose, requirements and perception by a number of gurus of VM. Mudge (1976) defined value as “the lowest cost to reliably provide the required functions or services at the desired time and place and with the essential quality”, where functions were explained as the specific purposes or use intends for something. In order to stress the user’s influence and reflect various features of value, SAVE international (1998) added “…and other performance factors to meet user requirements” to Mudge’s definition. Fowler (1992) presented value as a ratio of worth to cost (Equation 2.2), where worth is the lowest cost to obtain the basic function. He also argued the measuring true worth of an item should reflect the perception of the actual users/customers.

\[
\text{value} = \frac{\text{worth}}{\text{cost}}
\]  

\text{(Equation 2)}

Dell’Isola (1997) interpreted value as the relationship among function, quality and cost (Equation 3). Therefore, he defined “value is the most cost-effective way to reliably accomplish a function that will meet the user’s needs, desires, and expectation”.

\[
\text{value} = \frac{\text{function} + \text{quality}}{\text{cost}}
\]  

\text{(Equation 3)}

Ellegant (1989) further advocated that it was most important to retrospect the user’s requirements for defining and enhancing value. The total interlink between the definition of value and the end user requirements was agreed by Stylianopoulos (1989) as he stated “…in all instances, value is determined by the owner/ user”.

From the above discussions, it can be elicited that value in VM is the relationship between the user-required functions and cost. Essentially, it is the ability of a product or service to satisfy the user’s requirements for the cost paid. In this respect, value is determined by the judgement, expectation and perception of the user. This interpretation of value can be traced back to the utility theory in neoclassical economics. Against classical economics theory “value was determined by labour costs, subsequently modified to production costs (Smith,
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1776 and reported in 1991), the utility theory based view of value states customers spend their income so as to maximize the satisfaction they get from products (Bowman and Ambrosini, 1998). The satisfaction is called utility (Lipsey and Chrystal, 1995). Value then is a preferred combination of benefits compared with acquisition costs.

3 The value system of a construction project

Project Management Institute (PMI, 2000) has defined “A project is a temporary endeavour undertaken to create a unique product or service”. A project often takes place within a complex corporate, legal, financial and regulatory environment (Fox, 1984). This nature leads to a number of parties having a stake in the construction project from internal parties to external regulatory bodies, since the project decisions have a potential impact on all stakeholders (Cleland, 1986). The specific nature of a project will depend on the defined scope, which is defined in order to understand the client requirement, develop a project strategy and to enable continuous monitoring.

A construction project can be characterized by the following features (Gould and Joyce, 2002; Walker, 2002):

- an unique undertaking
- built on-site
- a defined beginning and end
- a specific preordained goal(s)
- a series of complex or interrelated activities
- a limited budget
- a network of internal and external interested parties with a stake in the project
- the use of a number of different resources and disciplines

From an organisation perspective, a project is a mean to achieve or support an organisation’s strategic plan. Therefore all projects must be coherent and compatible with the organisation strategy. An organisation always proposes more projects than its resources allowing. The key is selecting from these proposals those projects that make the largest and most balanced contribution to the objectives and strategies of the organization. This means prioritizing projects so that scarce resources are allocated to the right projects. Once a project has been selected for implementation, the focus switches to the project management process that sets the stage for how the project will be implemented or delivered. This process can be briefly illustrated as Figure 1.

The strategic management is concerned with understanding the internal and external environment of the organization and establishing a future direction of the organization. The way in which organizational structure and process are configured and adapted through the strategic management creates a ‘value chain’ (Porter, 1985). The value chain comprises key activities transforming inputs into outputs and contributing to the competitive position of the organisation. This transformation process creates value for the ultimate user/buyer. The primary activities, listed along the lower half of the value chain, are those which are directly involved in creating value for the user/buyer. The activities in the upper half are those which support the direct activities.

The strategic planning process can be considered as a hierarchy of strategic choice elements, with the mission and objectives as the highest level elements (Al Mufti and Cochrane, 1986). They are supported by the other elements: the strategies, goals, programs and projects. It is therefore necessary for the organisation to strategically manage individual projects to ensure they are procured in the most appropriate way to optimise the value added and thus fulfil the strategic objectives of improved competitive position. Having identified the relationship between projects and strategic management of the organisation, Grundy (1990) relates project value, business value and organisation value inherently within a holistic analysis as illustrated in Figure 2.
From the preceding discussion, it becomes evident that the value system within a construction project has to be understood within the context of the client value system and the associated strategic management process. A construction project therefore inherently forms part of the organisation’s value chain spanning all of the value adding activities of the organisation (Reve, 1990). Bell (1994) schematically represent in Figure 3 the concept that the project adds value to the organisation through it’s own processes. The project value chain forms part of a wider value system encompassing the value chains of the suppliers, customers etc. (Porter, 1985). At project inception and awareness stage, a close linkage between the client’s strategy and the strategic management requirements of a construction project should be clearly established and clarified.
From the perspective of system theory, a construction project is a system consisting of a number of subsystems. If each subsystem in the project value chain is run independently by a manager with local short-term objectives to optimise the apparent contribution of that subsystem, internal discontinuities may occur. Optimisation of subsystems do not necessarily optimise the total system. Differentiation between the individual elements in a project value chain also leads to “spatial differentiation” points at the interfaces (Morris, 1972). Due to the increased number of subsystems, fragmentation of interfaces increases with project complexity. It is necessary to view a construction project holistically for ensuring the production of value across the value system, optimising the individual subsystems in the context of the whole project system. The next section will discuss the nature of value for money in construction.

4 Current measures of value for money in China

4.1 The way to way for money in construction

Value for money must be understood in the context of the whole organisation strategy of the client. At the project awareness stage, the client’s strategy has a direct impact on the development of initial project requirements (Cherns and Bryant, 1984). These requirements may also lead to a project brief that represents a ‘wish list’ of all stakeholders, where the term stakeholder referred to investors, end-users and others with a real interest in — and the power to influence - the project outcome (Kelly and Male, 1988). In practice, it is difficult to define clearly and precisely how a project will meet the requirements of those stakeholders since each of them may well have very different perceptions and expectations of what (and who) the project is for. Furthermore, the financial resources available for construction projects are usually limited. So even if all possible project objectives could be clearly defined and agreed, the problem remains of how to build in the most cost-effective way. Therefore, value for money takes account of the requirements of those whom the project is for, as well as the money available to construct it.

Value for money is the optimum combination of whole life cost and quality to meet client’s requirements and depends on (Connaughton and Green, 1996):

- agreeing an unambiguous set of project objectives, and
- ensuring that they are achieved cost-effectively.

However, stakeholders’ requirements, expectations are not always mutually compatible, nor are they consistent with limitations on time and money. It is necessary to provide a communication and learning mechanism for stakeholders to make explicit stakeholders requirements and reach an agreement among key stakeholders about project objectives. This agreement will provide a structured framework within which subsequent decisions can be taken in accordance with these objectives and criteria. This means that project design and construction are developed and continuously evaluated against these objectives and criteria.

Value for money can be improved either by enhancing the requirements, or by reducing the cost of meeting them (Connaughton and Green, 1996; SAVE International, 1998). Indeed, it is often worth spending more money for a higher level of stakeholder satisfaction. The search for value for money is therefore trying to find
4.2 Measures of value for money for construction projects in China

This section examines the measures of ensuring value for money employed in current development process of construction projects in China. According to Connaughton and Green (1996), these measures enhancing value for money for clients possess at least one of the following features:
- assisting in the nature of the problem fully understood
- facilitating the communication among stakeholders
- ensuring decisions regarding the project made in the light of agreed objectives
- encouraging different options for achieving the agreed objectives to be considered
- ensuring decisions made on the basis of the best available data
- enhancing decisions drawing on the widest possible range of expertise
- reducing the cost for meeting requirements of the project

Table 1 Main measures of ensuring value for money in construction procedure

<table>
<thead>
<tr>
<th>Stage</th>
<th>Objectives</th>
<th>Main Measures to ensure value for money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment intention</td>
<td>• To clarify the need to build within the client organisation</td>
<td>• Strategic analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Discussion among the relative in-house staff</td>
</tr>
<tr>
<td>Project proposal</td>
<td>• To develop a rough sketch of the project</td>
<td>• Information communication and collection</td>
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<td></td>
<td>• To get approval from the planning department of the government and the</td>
<td>• Workshops and meetings</td>
</tr>
<tr>
<td></td>
<td>client’s parent organisation</td>
<td>• Structured work plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Checklist for project proposal</td>
</tr>
<tr>
<td>Feasibility study</td>
<td>• Further prove the necessity of the project</td>
<td>• Structured procedure for feasibility study</td>
</tr>
<tr>
<td></td>
<td>• To examine the feasibility of the project, technically, financially and</td>
<td>• Financial indices, such as NPV (Net Present Value), IRR (Internal Return</td>
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<tr>
<td></td>
<td>functionally</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• To determine the form in which the project is to proceed, ensuring that</td>
<td>• Considering and comparing with alternative solutions</td>
</tr>
<tr>
<td></td>
<td>it is feasible</td>
<td>• Workshops and meetings</td>
</tr>
<tr>
<td></td>
<td>• To develop client brief and project specification</td>
<td></td>
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<tr>
<td></td>
<td>• To get approval from government departments</td>
<td></td>
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<tr>
<td>Sketch design</td>
<td>• To develop a preliminary design for the project according to the client</td>
<td>• Competitive tendering</td>
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<tr>
<td></td>
<td></td>
<td>brief and specification</td>
</tr>
<tr>
<td></td>
<td>• To get approval from relative authorities</td>
<td>• Specifying cost limit of the project (Design to cost)</td>
</tr>
<tr>
<td>Detailed Design</td>
<td>• To obtain final decision on every matter related to design, specification,</td>
<td>• Reviewing and revising the schematic design before extending to next</td>
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<tr>
<td></td>
<td></td>
<td>and cost</td>
</tr>
<tr>
<td></td>
<td>• To develop working drawings for carrying out construction work</td>
<td>• Workshops and meetings for communication between client and designers</td>
</tr>
<tr>
<td></td>
<td>• To get construction approval</td>
<td>• Discussion between different disciplinary designers</td>
</tr>
<tr>
<td>Construction</td>
<td>• Competitive tendering</td>
<td>• To establish the project according to working drawings, specification,</td>
</tr>
<tr>
<td></td>
<td>• Structured approach to select contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Construction supervision system</td>
<td>• To hand over the project to the client for occupation</td>
</tr>
<tr>
<td></td>
<td>• Meetings as required</td>
<td></td>
</tr>
</tbody>
</table>
The lifecycle of a construction project has been broken down into a number of stages from idea generation to completion. Due to the influence of the planned economy, the standard model used in China’s construction industry is the work plan produced by the Ministry of Planning and Development in China. Table 1 lists the objectives and measures to ensure value for money for a project in each stage of the construction project development.

From the details listed in Table 1, it can be founded that there is no a planned, structured and rigorous approach, which is similar to VM, in current development process to ensure value for money for clients in China. The existing measures may well achieve value for money sometimes in some projects, but they are not good enough to achieve it all the time. This problem with current construction practice typically appears as:

- the projects with investment over RMB 5 million are often at least 20% of them cost overrun.
- clients often complained that completed construction projects failed to address their expectations.
- frequent change and conflict happened in the design and construction stage resulted in abortive work.

In summary, obstacles to value for money in the development process of construction projects in China are rooted in the nature of China’s construction industry, the nature and structure of the client organisation and the lack of a structured and systematic measure to achieve it.

### 5 The need for VM in the development process of construction projects in China

#### 5.1 The need for VM

Clearly, construction projects are facing to a series of complexities and difficulties to impede value for money for the client, caused by not only the political and economic environment of China, but also the lack of effective methods. Under this situation, it is necessary to utilise effective methods for enhancing value for money in the construction process. The following paragraphs will discuss what VM can do for achieving value in construction.

Referring to the experience of North America, UK, Australia and Japan, VM is applicable to hardware, building or other construction projects, and to “soft” areas such as construction processes, programming, management systems and organization structure. VM provide a systematic and structured approach for clients to achieve value for money from their construction projects by ensuring that:

- the need for projects is always verified and supported by data.
- project objectives are openly discussed and clearly identified
- key decisions are rational, explicit and accountable
- the design evolves within an agreed framework of project objectives
- alternative options are always encouraged and considered
- outline design proposals are carefully evaluated and selected on the basis of defined value criteria.

VM produce a number of benefits, including both tangible and intangible, for a construction project:

- cost reduction, by challenging the fundamental basis and design criteria of the project design, considering alternative solutions and eliminating unnecessary cost from the existing design.
- improved communication, team working and a shared understanding among key participants
- clear project objectives and better project briefing if VM is used in the early stage of a project
- improved client satisfaction through seeking the best balance between time, cost, quality and other project parameters
- an opportunity for client to formally participate in the design and construction process
- increased innovation

The discussion in section 4 reveals the absence of effective method to value for money in construction process in China. In consideration of the current situation of China’s construction industry and what VM can do, theoretically, it would be reasonable to conclude that VM may be a suitable approach to overcome or alleviate these obstacles to value for money in the development process of construction projects in China.
5.2 The insert points of VM in the development process

It has been widely agreed that VM should be used as early as possible in order to exert its potential and avoid too much redesign cost. However, in order to improve the acceptability of the VM framework, six most appropriate VM insert points have been identified based on the findings from the research fieldwork of benchmarking. The reasons for choosing these points are:

- to be close to key decision stages in project development in order to exert the potential of VM;
- to take advantage of the existing intervals in the project cycle in order to avoid too much change of the traditional construction process in China;
- to improve the applicability of the VM framework.

It should be noted that these VM opportunities are not exclusive. They are simply the six most likely insert points in the development process of construction projects in China. Theoretically, VM can be used at any point in the project life cycle. The six opportunities also do not mean that the VM study should be compulsorily conducted on any projects for six times. The scale, complexity and schedule and other features of the project will determine the number of VM studies.

![Figure 4 VM insert points in the development process of construction projects](image)

6 Conclusions

After a detailed examination of various definitions of value in the literature of VM, this paper concludes that value in VM is the relationship between the user-required functions and cost. The realization of value is depended on a preferred combination of benefits compared with acquisition costs. As for a construction project, it is necessary to view a construction project holistically for ensuring the project of value across the value of subsystems and optimize the individual subsystems in the context of the whole project system.

The realization of value for money in construction is blocked by many factors, such as the nature of the construction industry, the nature of client’s organisation, and the lack of systematic and structured measures for ensuring value for money. Although VM has been proved as a powerful tool to enhance value for money for clients in many countries, the investigation indicates that currently VM and its philosophy have not been fully used in the development process of construction projects in China. After a careful examination of benefits and characteristics of VM, it has become clear that there is a strong need for VM usage in order to achieve value for money for construction projects in China.
Acknowledgments

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