ESTABLISHING VALUE VARIABLES FOR DEFINING CONSTRUCTION PROJECT VALUE

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Abstract:
Across sectors, the usage of the word ‘value’ is too loose and broad. This is due to the value terminology is universal and applicable in various contexts, which often brings different meanings. The value terminology is distinctly applied for relative worth in across fields e.g. economy, commerce, mathematics, sociology, customs, ethics, and even arts and music. Defining value requires cognitive approach; that is the manner, in which an individual sees, perceives and thinks about something or some information takes action and behaves. But the complexity and subjectivity of value makes it more difficult to define explicitly. Moreover, defining value involves complex interpretations that need to be contextualized to an intended perspective. Hence to define value for a desire of obtaining a product, a process or a service, it is necessary to understand the definition of value that applies within the context. In the construction context, project value is considerably complex, as it constitutes of views on what is important to the client and their multi stakeholders. For an effective management of construction project value, its variables must be made explicit according to the intended context. Thus, this study investigates and proposes a notion of establishing a set of value variables in order to contextualize the definition of construction project value. In verifying the identification of value variables from theories, the qualitative research method was adopted using interviews survey and thematic analysis, which has established the variables of construction project value.

Keywords: Construction project value; Value concepts; Value variables; Context

INTRODUCTION
As defined in Dictionary.com (2019), the word ‘value’ is commonly defined as ‘worth’, which relates with either the monetary worth, material worth, estimated or assigned worth, equivalent worth or the worth of something for which it can be exchanged. However the value meaning and terminology is universal and distinctly applied for relative worth in multi contexts i.e. the economy, commerce, mathematics, sociology, customs, ethics, art etc. An early principle by Allport, Vernon and Lindsey (1960) mention that value is complex as it is classified in six orientations, i.e. ‘Theoretical Values’, ‘Economic Values’, ‘Aesthetic Values’, ‘Social Values’, ‘Political Values’ and ‘Religious Values’. Moreover, other philosophies by Laird (1969) and Hall (1952) acknowledge that defining value is abstract and subjective. However, value definition can be referred to a set of beliefs belongs to the ‘owner’ of the value, whom have influences to make judgements and decisions.

Dealing with the universality, complexity and subjectivity of value, this study aims to explicitly establish the variables of value for contextualizing definition of construction project value. The established value variables from the construction project context are adoptable for defining value from a specific perspective e.g. project briefing or project design etc.

The aim of this paper is achieved by accomplishing two study objectives which are:
i. To identify value variables from relevant theories; and
ii. To establish a set of value variables based on value experts’ views using qualitative method.
This paper discusses on value in construction, value concepts and variables, applied research method and analysis, establishment of value variables of construction project value, conclusion and recommendation.

VALUE IN CONSTRUCTION

According to Kerzner and Saladis (2009), value in construction is complex as it is made of a set of beliefs relative to what is significant to the client and their stakeholders associated with the project. For a construction project value to be managed throughout its life cycle, the value objectives must be in line with the client’s strategic and project objectives while reconciling and balancing with their multi stakeholders’ different expectations and priorities in delivering the project.

In built environment, as mentioned by Saxon (2005) in the “Construction Excellence” document – “Be Valuable. A Guide to Creating Value in the Built Environment”, subjectivity of value is the key reason for understanding and grasping the value concept. Again, it implies that the state of value refers to who is judging, which is supposed to understand and able to balance the diverse values of multi stakeholders. In addition, as cited in MoV (2010) by the UK Government, it is highlighted that value is known as a subjective judgement on project goals that makes it essential to manage value deliberately. Dealing with value subjectivity, it is necessary to define and reconcile the multi views of value.

Due to the complexity and subjectivity of construction project value, it is essential to understand what variables implicate value within a specific context. Establishing the construction project value variables leads to defining specific circumstances from the intended perspective being managed, e.g. from project briefing or project design perspective. The explicit variables provide clear value definition, and can be contextualized to specific criteria or conditions for a desire of managing and achieving optimum value delivery from the intended perspective. Thus the construction project value can be well defined and effectively managed.

VALUE CONCEPTS IN CONSTRUCTION

Being thoughtful of various value concepts is fundamental towards understanding the potential of value enhancement. There are various generic value concepts to be adapted and adopted in the construction project environment. In their origins, most of the concepts are from broad viewpoints of value principle, though the concepts are frequently denoted in the discussions on management of value in construction projects.

In the following discussion on value concepts, the meaning of ‘variable’ terminology in Dictionary.com (2019) defines as something that may or does vary or change. The value concepts have fostered vital thinking towards achieving the expected value and obtain potential enhancement through managing the value variables.

The following value concepts are discussed based on respective equations or diagrams to define the value expressions and each equation comprises of different variables of value that need to be managed:

i. Dell’ Isola value concept
ii. Carlos Farlon value concept
iii. Value Concept in the SAVE International Value Methodology Standard
iv. Value Concept in British European Standards (BS EN 12973:2000)
v. Value Concept in the Management of Value (MoV)
vi. The concept of construction project value criteria
Dell’ Isola Value Concept

\[
\text{Value} = \frac{\text{Function} (F) + \text{Quality} (Q)}{\text{Cost} (C)}
\]

Where;

- **Function** = The specific work that a design or item must perform
- **Quality** = The owner’s or user’s needs, desires and expectations
- **Cost** = The life cycle cost of the product or project

\[\text{Value} = \frac{\text{Function}}{\text{Cost}} \quad \text{Or} \quad \frac{\text{Benefits}}{\text{Price}}\]

**Figure 1.** Dell’ Isola value concept

This notable concept by value scholar Dell’ Isola (1982) is universal yet very well adopted in the construction environment. The concept is represented by an equation of value variables between ‘function’, ‘quality’ and ‘cost’.

Carlos Farlon Value Concept

\[
\text{Value} = \frac{\text{Function}}{\text{Cost}}
\]

\[\text{Or} \quad = \frac{\text{Benefits}}{\text{Price}}\]

**Figure 2.** Carlos Farlon value concept

A prominent value scholar Carlos Fallon (1980) defines value in two different perspectives i.e. from the value producer comprises of ‘function’ over ‘cost’ variables; while from value buyer comprises of ‘benefits’ over ‘price’.

Value Concept in the SAVE International Value Methodology Standard

\[
\text{Value} = \frac{\text{Function}}{\text{Resources}}
\]

\[\text{Or}, \quad \text{As a fair return or equivalent in goods, services or money for something exchanged.}\]

**Figure 3.** Value concept in the SAVE International Value Methodology Standard

In the International Value Methodology Standard and Body of Knowledge by the Society of American Value Engineers (SAVE) International (2007), the value concept is represented by the variables of ‘function’ over ‘resources’.
Value Concept in British European Standards (BS EN 12973:2000)

\[
\text{Value} = \frac{\text{Satisfaction of Needs}}{\text{Use of Resources}}
\]

**Figure 4.** Value concept in British European Standards (BS EN 12973:2000)

This value concept of British European Standards for Value Management as in British European Standards BS EN 12973 (2000) signifies the relationship between the ‘satisfaction of needs’ and the ‘resources’ that need to be balanced between the two variables.

Value Concept in the Management of Value (MoV)

\[
\text{Value} = \frac{\text{Function}}{\text{Cost}}
\]

Or

\[
\text{Value} = \frac{\text{Benefits}}{\text{Price}}
\]

**Figure 5.** Value concept in the Management of Value (MoV)

The Management of Value Guide as cited in MoV (2010) by the Office of Government Commerce (OGC) of the United Kingdom expresses the value concept by the above shown relationships as to be balanced among them. The key variables are ‘satisfaction of needs’ or ‘benefits’ (monetary and non-monetary), as against to ‘use of resources’ or ‘expenditure’ (money, people, time, energy, materials).

The Concept of Construction Project Value Criteria

**Figure 6.** The concept of construction project value criteria
As suggested by Male (2006) and taught in the Master Science Engineering lecture (MSE ICME, 2009), this value concept is contextualized to the construction project environment and in line with asset and project management; and procurement strategy practice. The value variables in the concept represent the typical project objectives set for construction projects i.e. quality, time and cost, and with additional value criteria being incorporated i.e. functionality and risks.

**IMPLICATION OF VALUE VARIABLES**

The value variables are impacting value dynamic of project. The relationships and interactions among the variables are aimed to balance in achieving best value of the project. As in [6], Saxon suggests that positive balance creates value, while the opposite destroys it. Balancing the variables involves the act of optimizing or ‘trading off’ among them, so that the project value can be managed.

Based on several exemplary value concepts, the following equivalences in Figure 7 indicate the implications of variables on potential value approaches; or how the magnitude of changes (positive or negative) to the variables implicates the dynamics of project value. These implications prove that the variables are flexible to changes and controllable in the manner of achieving the intended value goals.

**Variables Implications in Dell’ Isola Value Concept**

<table>
<thead>
<tr>
<th>Cost Reduction Approach</th>
<th>Value = Function + Quality [\downarrow] Cost</th>
<th>Reducing cost but maintaining the function and quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function Increase Approach</td>
<td>Value = Function + Quality [\uparrow] Cost</td>
<td>Increasing either the function or quality or both but maintaining the cost</td>
</tr>
<tr>
<td>Compound Approach</td>
<td>Value = Function + Quality [\uparrow] Cost</td>
<td>Reducing cost and at the same time increasing the function and quality</td>
</tr>
<tr>
<td>Expand Growth Approach</td>
<td>Value = Function + Quality [\uparrow] Cost</td>
<td>Increasing the cost but at the same time improving function and quality at a higher proportion</td>
</tr>
</tbody>
</table>

*Figure 7. Implications of value variables of value concept by Dell’ Isola.*
Variables Implications in BS EN (2000) Value Concept

The value concept by BS EN 12973 (2000) uses different value variables in achieving different value optimizations i.e. ‘Satisfaction of Needs’ and ‘Use of Resources’. The following five (5) equations in Figure 8 describe the variants of value optimizations in project, which implicated by the magnitudes of value variables of the value concept.

<table>
<thead>
<tr>
<th>Value</th>
<th>Satisfaction of Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use of Resources</td>
</tr>
<tr>
<td>=</td>
<td>Very much more satisfaction</td>
</tr>
<tr>
<td></td>
<td>Small increase in resources</td>
</tr>
<tr>
<td>=</td>
<td>Much more satisfaction</td>
</tr>
<tr>
<td></td>
<td>Same resources</td>
</tr>
<tr>
<td>=</td>
<td>More satisfaction</td>
</tr>
<tr>
<td></td>
<td>Fewer resources</td>
</tr>
<tr>
<td>=</td>
<td>Same satisfaction</td>
</tr>
<tr>
<td></td>
<td>Much fewer resources</td>
</tr>
<tr>
<td>=</td>
<td>Slightly less satisfaction</td>
</tr>
<tr>
<td></td>
<td>Very much fewer resources</td>
</tr>
</tbody>
</table>

Figure 8. Implications of value variables of BS EN 12973 value concept.

Variables Implications in MoV (2010) Value Concept

The MoV (2010) emphasizes the implications of its value variables towards maximizing value, taking account of and reconciling the views of all stakeholders, and balancing the ratio of ‘benefits’ to ‘expenditure’. Three (3) balancing situations are indicated below involving the value variables:

i. Balancing the needs and benefits (monetary and non-monetary by reconciling different stakeholders on their differing expectations.

ii. Balancing the use of resources or expenditure, taking into account the organization’s priorities and availability, including articulating trade-offs among the resources (money, people, time, energy, materials etc.)

iii. Balancing the overall satisfaction of needs (benefits) with the use of resources (expenditure), which to achieve the highest value ratio.
ESTABLISHING VARIABLES OF CONSTRUCTION PROJECT VALUE

Variables of Value Identified from Theories

As resulted from critical reviews and discussions on multi value concepts, value variables and their implications towards project value; Table 1 presents a list of value variables as derived from various value concepts in the identified theories, which applicable in the context of construction project.

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Variables in Value Concepts</th>
<th>Value Concepts in Identified Theories</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Quality</td>
<td>Dell’ Isola (1982); Male (2006); MSE ICME (2009)</td>
</tr>
<tr>
<td>b.</td>
<td>Function</td>
<td>Dell’ Isola (1982); Carlos (1980); SAVE (2007)</td>
</tr>
<tr>
<td>d.</td>
<td>Cost</td>
<td>Dell’ Isola (1982); Carlos (1980); Male (2006); MSE ICME (2009)</td>
</tr>
<tr>
<td>e.</td>
<td>Price</td>
<td>Carlos (1980)</td>
</tr>
<tr>
<td>f.</td>
<td>Benefits</td>
<td>Carlos (1980); MoV (2010)</td>
</tr>
<tr>
<td>g.</td>
<td>Satisfaction of Needs</td>
<td>BS EN (2000); MoV (2010)</td>
</tr>
<tr>
<td>h.</td>
<td>Resources</td>
<td>SAVE (2007)</td>
</tr>
<tr>
<td>i.</td>
<td>Use of Resources</td>
<td>BS EN (2000); MoV (2010)</td>
</tr>
</tbody>
</table>

The identification of value variables from the literature reviews (as in Table 1) needs to be verified through further investigation. Hence subsequently, the qualitative research method was adopted; using interviews survey and analysis.

Variables of Value Identified from Interviews Survey

The interviews with value experts were conducted to investigate and verify the theoretically identified variables of value from the construction project context. The objective of the survey is for identifying value variables from the experts’ views on their respective value concepts in construction.

Interview Respondents’ Profiles

The interviews respondents’ profiles are among value experts whom are based on their professional experiences and involvement, their competencies of relevant certification, academic qualification, and training, and also relates to their practices and consultation in the management of value in construction projects of Malaysia. The total numbers of eleven (11) respondents are selected using purposive sampling, which represent fifty percent (50%) of the twenty-two (22) units of whole population of identified value experts in Malaysia. The selection basis for the targeted sampling of population is:
i. Respondents have professional experiences and/or active involvement as committees of the Institute of Value Management Malaysia (IVMM); and

ii. Respondents have obtained relevant certification (e.g. Certified Value Manager), and/or relevant academic qualification, and/or professional training in the management of value in construction projects.

**Analysis of Interviews Survey**

The initial thematic analysis on the audio transcription was conducted manually. The objective of the thematic analysis was to identify the variables of value from the construction project context. At the initial round of manual review, the researcher had identified ten (10) themes from the transcriptions. Repeated reviews on the audio recordings and transcriptions have discovered two (2) pairs of themes that refer to same meanings. First pair, the theme ‘benefits’ by a respondent was alternatively referred to another theme with same meaning, which was ‘outcomes’. Secondly, several respondents used similar themes either ‘functionality’ or ‘function’ interchangeably.

Initially the manual thematic analysis on the interviews transcriptions was conducted for identifying variables of value of construction project value, which have listed ten (10) potential value variables i.e. Benefits (alternately referred to ‘Outcomes’); Outcomes; Cost; Functionality (interchangeable with ‘Function’); Quality; Satisfaction; Time; Resources; Function; and Risks.

Subsequent to the manual thematic analysis, similar analysis was repeated using the computer software (Atlas t.i.) on the same transcriptions. The researcher applied the software for repeating thematic analysis with the knowledge of two (2) pairs of themes had same meanings. Hence the computerized thematic analysis had only identified eight (8) themes from the transcriptions by dropping the themes with same meanings.

**Result of Interviews Survey**

<table>
<thead>
<tr>
<th>List of Respondents</th>
<th>Extracted Themes (Variables of Value Concepts in Construction)</th>
<th>Identified Variables of Value in Construction Project Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent 1</td>
<td>Benefits (or Outcomes); Cost</td>
<td>1. Quality</td>
</tr>
<tr>
<td>Respondent 2</td>
<td>Functionality; Quality; Cost</td>
<td>2. Functionality</td>
</tr>
<tr>
<td>Respondent 3</td>
<td>Satisfaction; Function; Quality; Cost; Benefits</td>
<td>3. Satisfaction</td>
</tr>
<tr>
<td>Respondent 4</td>
<td>Quality; Function; Cost</td>
<td>4. Benefits</td>
</tr>
<tr>
<td>Respondent 5</td>
<td>Function; Cost; Benefits</td>
<td>5. Cost</td>
</tr>
<tr>
<td>Respondent 6</td>
<td>Function; Quality</td>
<td>6. Time</td>
</tr>
<tr>
<td>Respondent 7</td>
<td>Function; Quality; Cost</td>
<td>7. Resources</td>
</tr>
<tr>
<td>Respondent 8</td>
<td>Function; Time; Cost</td>
<td>8. Risks</td>
</tr>
<tr>
<td>Respondent 9</td>
<td>Function; Satisfaction</td>
<td>Note: The sequence of value variables is NOT arranged to any priority or importance order.</td>
</tr>
<tr>
<td>Respondent 10</td>
<td>Function; Quality; Cost; Time</td>
<td></td>
</tr>
<tr>
<td>Respondent 11</td>
<td>Benefits; Satisfaction; Functionality or Function; Resources; Risks</td>
<td></td>
</tr>
</tbody>
</table>
Table 2 presents the results of thematic analysis of the interviews survey’s transcriptions. Initially, the value variables are extracted from each respondent’s definition of value concept in construction project context. Then the thematic analysis has identified eight (8) value variables, which has eliminated two (2) variables that bring same meanings.

Finally, the analysis result has determined a set of value variables of construction project value as listed in Table 2. However, the list is not intended to prioritize the variables to any importance order. The establishment of those value variables has verified the earlier theoretical findings from literature reviews, which the identified eight (8) variables are cited in several literatures as indicated earlier in Table 1.

Hence, this qualitative verification has established that the variables of construction project value are ‘Quality, Functionality, Satisfaction, Benefits, Cost, Time, Resources and Risks’. In defining construction project value, these key variables can be accounted for main attributes of the definition as illustrated by Figure 9 below. The value variables are linked to defining ‘worth’ in the construction project value context, where these variables can be exchanged (or ‘traded-off’) among them in achieving the optimum value.

![Figure 9. Illustration on the established variables of construction project value](image-url)

**LIMITATION AND DISCUSSION**

The limitation of this study finding is the definition of construction project value only focuses on the key variables of the context. The definition of value from construction project context should be describing the circumstances that represent every key variable. Those circumstances will describe the specific criteria or conditions of each key variable, which will further define the respective value variables more objectively. As such, value managers can utilise the descriptions of criteria or conditions of each value variable for defining further construction project value from a specific perspective e.g. from the perspective of project briefing or project design or procurement strategy.

Another limitation is the study is solely obtained through the qualitative research method (interviews survey). The method is applied for an exploratory stage, i.e. to obtain the value experts’ views in order to identify key variables of construction project value. This approach is effective in collecting qualitative data, which able to verify the earlier theoretical findings through literature reviews.
However, as suggested by Fellows (2003) it is often the qualitative method is applied as a precursor to quantitative method. In addition, the mixed use of both qualitative and quantitative methods in conducting a research can be more powerful in attaining understandings, verifying findings and establishing conclusions.

**CONCLUSION AND RECOMMENDATION**

The study finding has established a set of key value variables in the generic context of the construction project value. The establishment of eight (8) key value variables is fundamental for value managers in understanding what attribute may vary or change in quest of delivering or achieving the optimum project value. With the knowledge, construction project value can be effectively managed and maximized through optimizing (or ‘trading off’) among those variables. This study finding has also fostered the dynamic thinking towards obtaining potential value enhancement and optimizing value through managing the variables.

However for more effective management of value, the definitions of the established key variables of construction project value need to be further researched. It is recommended to extend the definitions of respective variables to the criteria or conditions that specifically describe each variable. Adopting those key variables, a further research will investigate the circumstances that contextualize the definitions of project value to a specific perspective, such as from the project briefing or project design or procurement strategy etc. The contextualization of project value definition in different perspectives is in lined with the Value Chain Management (VCM) concept as discussed by Wong, Cheung and Chan (2004), where the construction project value is transmittable and it weaves to align within the construction project phases that involve multi stakeholders.

For further research, the quantitative method can be applied on the qualitative finding, which will bring to the application of triangulated qualitative and quantitative methods. As such, defining construction project value can be more objective, contextualized and its subjectivity can be minimized. Thus, the intended construction project value can be effectively and efficiently managed, and optimally achieved by the value managers.

**ACKNOWLEDGMENT**

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