

# CRITICAL REVIEW OF THE CONCEPT OF VALUE IN LEAN CONSTRUCTION THEORY

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## ABSTRACT

The importance and huge potential of considering Value delivery from the very early stages of building & infrastructure projects have broadly been recognized. Lean Thinking elevates Value to the customer as a fundamental principle in the manufacturing sector and the consideration of Value in this way has transferred into Lean Construction. Consequently, satisfaction of customer requirements has predominated over satisfaction of societal issues. Based on the situation described, the following hypothesis is formulated: “The dependence of society on buildings and infrastructure elevates the needs of society within customer requirement priorities and drives the need to expand common understanding of Value from a Local to a Global context”. This hypothesis does not ignore the importance of money and other parameters such as quality, function, etc. used to deliver Value. This paper proposes society is dependent on construction and it should predominate over particular interests, if the construction industry potential is to be fulfilled. Based on the experience achieved to date, Lean Construction can use its huge potential to move towards an expansion of the common vision of Value, going far from current production process activities. Finally, a preliminary, conceptual model of Value in a Global context is presented that demonstrates how a project can be positioned within the value parameters.

## KEY WORDS

Lean Construction, Lean thinking, Society, Value.

## INTRODUCTION

There is currently much written around the concept of Value representing the individual vision of different authors working in diverse sectors: sociology, business, marketing, engineering, etc. From a construction industry perspective, the concept of Value has been commonly related to parameters such as cost, function, quality, etc. Consequently several definitions, equations and models revolve around this concept. and despite an ongoing effort by researchers to define or develop a common understanding, a universal theory of Value in construction industry has not materialised. Bertelsen and Emmitt (2005) recognized a deficiency in the literature along the concept of Value and they argued that “Without understanding the customer,

the concept of value is undefined, and without a tangible concept of value, waste is even more intangible” (Bertelsen and Emmitt, 2005:74). In Lean Thinking (LT), value

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generation has been broadly connected with waste. “Value generation is defined as meeting client requirements while minimizing waste” (Forgues et al. 2008: 435).

In 1992, Koskela introduced LT philosophy into construction and reformulated its principles and practices to tackle particular features of building projects. In the book “Lean Thinking”, Womack and Jones (2003) described attributes of value from the perspective the manufacturing sector. According to Koskela (2004), from Womack and Jones point of view, the concept of Value is considered “something materialistic which is possible to understand and to specify.” (Björnfot and Stehn, 2007:35) confirm that “Value, as defined in Lean thinking (Womack and Jones 2003), refers to materials, parts or products”.

Although the introduction of LT philosophy into the construction sector necessitated the modification of original concepts, principles, uses, etc.. it has been recognised that the concept of Value is “... probably the most difficult to approach in the new way of managing construction projects” (Bertelsen and Koskela, 2004:6). At present, the concept of Value from a Lean Construction (LC) perspective continues to be a confusing term which has not been deeply investigated. LC experience commonly connects construction practices with the Transformation-Flow-Value model (TFV) of Koskela, where Value is mainly delivered in the production process on site; consequently, most efforts have been used to satisfy customer requirements and little consideration given to society issues. With the rise of sustainability, the banking crisis and subsequent recession, the construction industry is recognized as a controversial topic and it is timely to go back and rethink current definitions, equation and models of Value and incorporate the close relationship between building projects and the society as a whole. This idea coincides with the vision of other authors such as Bertelsen and Emmitt (2005) who argued that clients represent different interests from three main groups: owner, users and the society, who value different things at different times through the life cycle of building projects. Previously, Koskela (2000) had also underlined the idea of Taguchi, who considered the wider society as a customer.

In seeking to understand this situation, this paper provides:

- An overview of the features of the Value concept;
- A proposition to expand the concept of Value in current LC practices; and
- A preliminary model of Value including the relationship between building projects and society as a whole

## **MAIN FEATURES OF VALUE**

The main features of the concept of Value can be identified from a literature review as follows:

**Objectivity:** The objective nature of Value has been broadly investigated from diverse knowledge fields, and therefore, it is important to underline that this feature comes from Greek philosophy in which Value was understood as a property of goods or services, a perspective which is still strongly associated to the concept of Value, thus it is argued that “Engineers and economists alike see value in terms of the features that a product or services has.” (Shillito and De Marle, 1992:3). Consequently, Value has been linked to measurable attributes or physical product features and several authors have emphasized this vision (Green 1997; Thomson et al 2003,a; Thomson et al. 2003,b). “The value delivery activities of the construction

industry can be characterised by the prominence of an objective view of value ...The industry's current understanding of value is such that it routinely fails to consider the relationships between buildings and the people who will provide, use and be influenced by them. Because its understanding of value is currently biased towards an objective view" (Thomson et al. 2003,b:197).

**Subjectivity:** The subjective nature of Value arises as one of the most complex features, to which everyone is able to contribute with an individual vision of the concept. (see Green 1997; Neap and Celik 1999; Thomson et al 2003,a; Emmitt et al. 2004; Wandahl 2005). Thus, current theories or management tools have focused their attention on stakeholders involved from the early stage of projects (briefing and design activities). According to Christoffersen (2003) "The perception of value is individual and personal, and is therefore subjective. Indeed, agreement of an objective best value for a group will differ from the individuals' perception of value." (cited in Emmitt et al. 2004:3). In this way, Value Management (VM) has contributed to an explicit customer perspective of Value from the early stage of projects, where opportunities to add Value are increased. (Kelly et al. 2004)

**Relativity:** The concept of Value is also relative, which means that Value is a comparative concept. Important information previously cited by Wandahl and Bejder (2003:4) based on the citation of Fink' speech (2002): "Value is essentially comparative. Goods do not have value each on their own. Goods only have value in comparison with other goods, e.g. there could not be good houses if there weren't bad houses." "Value is certain forms of characteristics, not substantive quantities. To create value is not to create products, but products with certain characteristics and qualities."

**Context Dependent:** The concept of Value varies according to different contexts where it is measured or perceived, Wandahl (2005) exemplifies this using an ordinary stone, so, the Value associated to this stone varies according to the context in which it will be used. "If you need a stone for a road barrier, a big stone would have great value. On the other hand, if you need a stone to play ducks and drakes with, perhaps a small flat stone would be of value." (Wandahl 2005:65). Thomson et al. (2003.a) have also discussed Value as a context dependent concept.

**Dynamism:** The concept of Value varies across time and therefore, the influence of time must be analysed from two main dimensions: on-site activities (Building process) and occupancy (Building use). It is important to underline, that the dynamic nature of Value has been documented by authors such as Green 1996; Green and Moss 1998; Thomson et al. 2003,a; Wandahl and Bejder 2003; and Wandahl 2004.

Finally, linking Value to society gives rise to another important characteristic of Value as an *oscillating concept*, which is delivered for a particular building project, whose final result impact society as a whole and consequently the judgements of Value for future projects, and so forth. In this way Value becomes a phenomenon that moves constantly between a particular, local context (building/infrastructure projects) to a global context (Society). It is clear that the concept of Value continues to be a difficult concept to investigate within the construction industry, where different perspectives contribute with different definitions, equations, models, etc.

## VALUE FROM A LEAN CONSTRUCTION PERSPECTIVE

Going back to the genesis of LT in the manufacturing sector, the word Value was introduced as a new concept to analyse production performance. Thus, the concept of Value in the book “Lean Thinking” was defined as “a capability provided to a customer at the right time and at an appropriate price, as defined in each case by the customer.” (Womack and Jones, 1996: 311). Thus it has been recognized that LT practices “must start with a conscious attempt to precisely define value in terms of specific products with specific capabilities offered at specific price through a dialogue with specific customers” (Womack and Jones, 2003:19). As a result, this concept of Value from LT perspective has transferred into the construction industry as being mainly associated with the on-site production process missing the opportunity to add Value from the early stage of projects. This has been recognized by authors such as Emmitt et al. (2004) and Emmitt et al. (2005).

The LC perspective of Value has been strongly influenced by Lean production, Koskela (2000) in his deep investigation, distinguished three theoretical models to see production: Transformation, Flow and Value generation. As a consequence TFV arose as a theory of production and a “value generation model” which included five principles: Requirement capture, requirement flow-down, comprehensiveness of requirements, capability of production subsystems and measuring of Value. In this way, Shewhart (1931) played an important role in this initial value generation model, but his work lacked value generation arising from the internal mechanisms of suppliers. Koskela (2000) added a third subsystem (order-delivery) to the two previous subsystems proposed by Shewhart’s value model (product design and production). Thus Koskela’s “value generation model” identifies two trajectories currently used by the construction industry: Quality-based method and marketing-originated Value-based method.

Research in LC practice shows that Transformation, where input is transformed into output along on-site activities and Flow, where control and improvement of organization and planning activities, have both been widely applied across the supply chain. However, Value generation has focused on the particular requirements of customers to the exclusion of the wider societal issues even though the customer is both part of and has a relationship with Society. Therefore, it is important to explore the current situation and future development of the concept of Value in LC.

Value generation: where are we?

Along time, money has been a decisive parameter guiding business decisions in different sectors, thus, construction has been defined as “a practice-oriented business, partly due its long history. The practice-oriented approach leads to the fact that the focus of management is on getting the building constructed i.e. on transforming inputs to outputs.” (Leinonen and Houvila, 2000:1). As LC has been influenced by Lean production experience, there is a common tendency to see construction as a transformation process, where Value delivery is associated to the fulfillment of customer requirements, in this way, Koskela’s “value generation model” strongly represents the current Value’ vision of LC practitioners. Thus, it has been argued that “The Value Management ensures that the construction process generates the value wanted by the client. As most of the product value is defined through the design, the Value Management during construction mainly looks after the process related value

such as timeliness, dialogue with the owner, users and other stakeholders, public relations and good neighbourhoodship” (Bertelsen and Koskela, 2002: 7).

Through the IGLC forum, several authors have contributed to an expansion of the common perspective of Value. Thus, in 2000, Leinonen and Houvila based on the classification of Best and De Valence (1999), underlined three kinds of value, which should be considered: “ Developer sees value as the difference between capital costs and income ie. Profit (Exchange value), owner/occupier adds occupancy and maintenance cost and apart from avoided rent, value also include issues concerning corporate image (Use value). Third type of value is attached to the attractiveness and desirability of the building (Esteem value)” (Leinonen and Houvila, 2000:2). According to Wandahl and Bejder (2003), Exchange value is linked to market value, meanwhile Use value is linked to utility value which closely represents the concept of Value in LC experience: “Utility values are associated with the technical and aesthetic construction and the use of the construction, e.g. brick type, top lighting, color, usability, flexibility, etc.” and “Market value is closely connected with the utility value. It describes the value of utility, quality in money and is closely related to demand.” (Wandahl and Bejder, 2003:2).

Opportunities to add Value are increased from the early stage of a project and this has lead to a growing pressure to identify customer requirements early. Consequently, it is argued that LC should start with “...the briefing and conceptual design stages and managing the flow of decisions through to the completed building, thus helping to deliver value within a lean framework.” (Emmitt et al. 2004: 1). This clearly signals that the big potential of Lean Design in construction has been postponed for the application of Lean practices on site production process. (Thyssen et al. 2008:507-8). This tendency has also been related to the big responsibility of designer and the common perspective of Value “Value is generated through a process of negotiation between customer ends and means. The first role of the designer is to make explicit to customers the consequences of their desired...” (Ballard and Howell, 1998:5). “...in building construction, design plays an essential role in the efficiency of productive process and in the production of value to the clients.” (Fabricio et al. 1999:346). Consequently, stakeholders participation has been an important topic included in current experience. Thus authors such as Ballard (2006) have been working in the adoption of a model of project definition with a Value generation perspective. This new model gives relevant importance to the stakeholders’ perspective of value. Development of the Target Value Design model by Ballard is ongoing and (at the date of this paper) the detailed Value discussion has yet to be published. Stakeholders involvement is considered a key element in generating Value; therefore, it is important to underline the contribution of Emmitt et al. (2005), where the concept of Value is divided into:

External value, which is the client/customer value, the value that the project should end up with and the delivery team focus on achieving.

Internal Value, by and between the participants of the delivery team.

This classification allowed a view of the stakeholders universe in the wide sense; thus, based on the previous work by Emmitt et al. (2005) and Cuperus and Napolitano (2005), Björnfort and Sardén (2006) argued that internal value should be delivered considering three groups of stakeholders: the owner, the user and the society. Meanwhile external Value should consider contractor and sub-contractor – designer.

This demonstrates an increasing interest in the concept of Value and it is possible to observe how the current Value perspective of LC practitioners has been influenced by other theories from diverse knowledge fields. For example; authors such as Wandahl and Bejder (2003) introduced Value Based Management to the IGLC forum which places personal values into organizations. Marketing strategies have also been introduced as a measure of value generation process (see Lima et al. 2009).

### **VALUE GENERATION: WHERE SHOULD WE GO?**

The reliance of society on the output of the construction industry should be the core reason to expand current perspectives of the concept of Value, which to date has only broadly linked satisfaction of customer requirements for particular projects. Lean Construction has been understood as a “process of delivering value to the client through a temporary production system...” (Bertelsen and Emmitt, 2005:1). This perspective of value should be expanded to look at the global picture particularly considering the close relationship of construction output with society in general. As a result there is an intrinsic responsibility embedded within the construction industry for society. In this case society is defined as “a large group of people who live together in an organized way, making decisions about how to do things and sharing the work that needs to be done. All the people in a country, or in several similar countries, can be referred to as a society.” (www.dictonary.cambridge.org). Therefore, building & infrastructure projects are the physical evidence of human decisions which reveal how resources are distributed to satisfy human needs.

In this way, the concept of Value should be represented in a global context, where social, economic and political constrains should be considered (Figure 1). Obviously, the impact of Value generation within society must be considered in current and future building projects and their relation to the existing built environment and social problems. At present, public and private organizations are concerned about topics such as the preservation of natural resources, global warming, etc. consequently terms such as sustainability arise from practices of developed countries. “A growing number of writers over the last quarter of a century have recognised that the activities of an organisation impact upon the external environment and have suggested that such an organisation should therefore be accountable to a wider audience than simply its shareholders.” (Aras and Crowther, 2008:434). However, the impact of the construction industry is deep and connected with the social welfare of human populations. For example, this situation is evident through social housing projects, where the needs of end users cover more than a simple physical solution (the house), investment in the provision of housing should generate of a return to society through improved health, reduced crime, increased employment, integration into society, etc. This is the reason why construction should consider the concept of Value in the Global context, looking to satisfy society as a whole and construction policies should include this expanded concept of Value from inception of all projects.

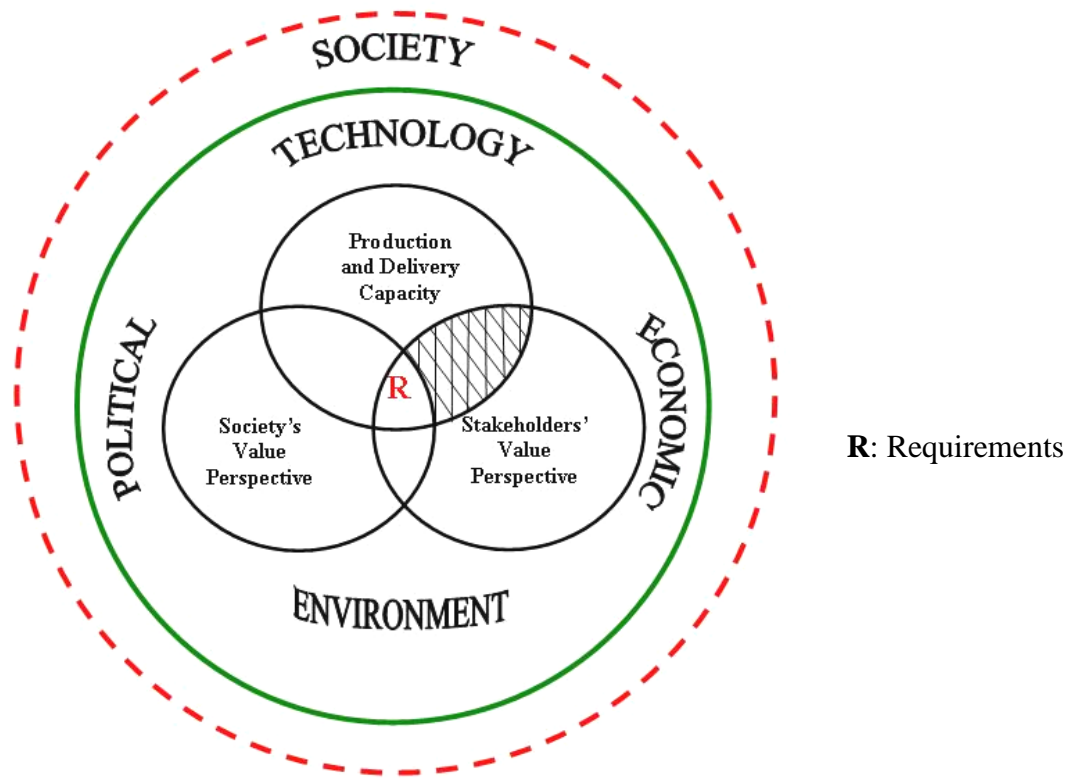


Figure 1: Value in a Global Context

*Note: Normally, the understanding of Value is falls into the hatched area*

Figure 1 shows the common situation in the construction industry, where Value is created and delivery at Production Level - here the economic perspective of stakeholders predominates (hatched area). This paper proposes that Value definition for building & infrastructure projects should move closer to the central part of this diagram (R), where all the relevant actors contribute to the generation of Value. In this way, technological tools and public policies add Value to society in a global sense, where environmental and social issues are also main goals for the construction industry. It can be seen however, that the dynamic nature of value as an oscillating concept over time is missing from the model shown in Figure 1.

## CONCLUSION

The experience of the construction industry in deliberating the concept of Value is ample; however, the literature review makes it evident that the understanding of this concept can be associated to individual perspectives of different authors investigating this concept. As a result, a global understanding of Value has not yet been assimilated by both researchers and practitioners. Consequently, the following deficiencies have been detected in current understanding:

The huge scope of the concept of Value means the Value generation process changes according to project features and authors' perspectives;

The concept of Value from LC perspective has been associated with on-site activities at production level, where Value generation is linked to the satisfaction of customer requirements; and

The impact on society is missing as current practices aim at satisfying only end users and/or clients requirements.

As a result, current perspectives should be extended to consider the impact caused by building & infrastructure projects to the society as a whole. In this way, LT practices can contribute in the future. It is important to recognise that LT goes far beyond simple waste reduction aiming at a continue improvement across the entire process by understanding and generating Value for the customer. In this way, previously mentioned authors consider that society can be included as part of the common customer-client focus perspective.

Finally, this paper is part of an ongoing PhD programme. The preliminary, conceptual model provides a basis for the next stage of the work which will expand the current vision of the Value concept from its current production level. This is in response to a growing global interest in sustainability, green practices, social responsibility, etc. that have yet to become integral aspects of construction practice. It is time to rethink the Value proposition offered by the industry and in line with Lean Thinking, the first step must be a new understanding of Value considers its impact to society as a whole. Society is too important to be postponed over particular customer requirements; it does not mean money is not important, but questions whether profitability should be placed in the first priority or accepted as necessary but not leading.

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