Drevland, Frode, Lohne, Jardar and Klakegg, Ole Jonny
(2018) Defining An Ill-defined Concept - Nine Tenets On
The Nature Of Value. *Lean Construction Journal* 2018
pp 31-46 (submitted 24Jul2017; Accepted 05Mar2018)
www.leanconstructionjournal.org

Defining An Ill-defined Concept – Nine Tenets On The Nature Of Value

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Abstract

Question: What is value?
Purpose: The purpose of the paper is to explore the concept of value on a fundamental level to arrive at a definition that is usable within the context of Lean Construction
Research Method: Literature study and abductive reasoning
Findings: Value is the result of an evaluative judgment. This judgment is guided by values and based on the evaluator's knowledge at hand. It is always based on comparing two or more alternatives in a given context. This context envelops all get and give consequences for a particular party from a decision made on the basis of the value judgment. The get and give consequences are always in the form of gained or lost experiences, or expressed in monetary terms as a placeholder for experiences. The consequences are not summative; the value judgment is done by considering them all at once.
Limitations: This is a conceptual paper; the practical applicability of the findings is not explored.
Implications: Value should be considered as something that fathoms more than the very narrow needs based view that is common in much of the LC literature.
Value for authors: Better understanding of the concept of value
Keywords: Value, Theory, Lean Construction
Paper type: Full paper

Introduction

The Lean Construction (LC) community commonly agrees upon that the goal of projects is to deliver value (Emmitt et al. 2005). However, value as a concept is an ambiguous one (Salvatierra-Garrido et al. 2012). Not surprisingly, a commonly agreed upon definition of value has not yet been found (Thyssen et al., 2010). According to the authors' experience, the lack of such a definition leads to people having their own mental models

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of what value is. Consequently, higher level discussions on the subject of value are difficult. It is, for example, a challenge to discuss how to maximise value if it is not first agreed upon what value is.

Reviewing the LC literature, limited effort in regards to tackling the fundamental nature and base definition of value is found. Despite Salvatierra-Garrido et al. (2010)'s thorough identification and discussion of the main features of value in the literature, they offered no comprehensive definition of value. Equally, little effort is made to clear up problematic areas such as the subjective-objective dichotomy. Furthermore, value features of Salvatierra-Garrido et al. are not bolstered by in-depth discussion and are mainly substantiated by citing literature. Accordingly, the literature review leading up to this paper revealed that some of the overall "truths" about value that are being purported seem to have entered the LC literature by authors quoting non-academic sources. For example, Emmit et al. (2005) is perhaps the most frequently used source when arguing for value being subjective. This paper, however, only base this on a presentation at an LCI conference (Christoffersen, 2003, cited in Emmitt et al., 2005). In the context of value within Lean Construction, this is, in the eyes of the authors, problematic. Value is arguably the most fundamental concept in Lean Construction, upon which all theory and concepts are directly or indirectly dependent.

The paper sets out by defining what value is on a fundamental level. This is done by presenting nine tenets on the nature of value. These are based heavily on Holbrook (1998) whose value typology is widely recognized (Sánchez-Fernández and Iniesta-Bonillo 2007). Less recognized, but in our opinion more important, is Holbrook's base definition of value and its nature.

We start out by providing an overview of the most relevant definitions of value, including the one outlined by Holbrook. Following this, nine tenets on the nature of value and the reasoning behind them are presented. After that, we show how these can be combined into a coherent definition of value. Finally, we discuss the implications of the tenets for the understanding of value.

This paper is a revised version a paper previously presented at the 23rd Annual Conference of the International Group for Lean Construction (Drevland and Lohne 2015).

Methodology

The problem of defining value has been addressed using a pragmatic research approach. Within the pragmatic paradigm, *"inquiry aims at utility for us rather than an accurate account of how things are in themselves"* (Rorty 1999). Thus, we have not tried to develop or find the one true definition of value in a positivistic sense, but rather to arrive at a definition that we believe would be useful for in the context of Lean Construction.

To do this, we first undertook a scoping study, as described by Arksey and O'Malley (2005), to identify relevant literature. Here, we looked not only for literature explicitly discussing value in construction projects but also for literature from other fields that deal with customer value of products. Furthermore, a structured literature search was undertaken to find all value related papers presented in the Lean Construction community, that is either through the LCJ or IGLC. These papers were reviewed and analyzed to determine what, if any, definition of value was employed.

Based on the identified literature, abductive reasoning was used to arrive at the nine tenets presented. Abductive reasoning is a form of analogic reason (Minnameier 2010). It is essentially an intelligent guess, based on an incomplete body of evidence (Walton 2014). The more common approach of inductive reasoning is limited in the sense that is can only merely extrapolate and generalise something already at hand (Minnameier 2010). Abductive reasoning, however, is inventive and able to provide new concepts (Reichertz 2009).

Theoretical framework

Different value definitions

Part of the reason that value is such as an ambiguous and ill-defined term is arguably caused by it being a common word in the English language, with a broad range of meanings. Amongst other, the Oxford English Dictionary (2011) lists value, as a noun, as "the numerical amount denoted by a mathematical term," "the relative duration of a sound signified by a note" and "the worth of something compared to its price". However, common language usage is not the focus of this paper. Rather, we are interested in the usage of the term in a professional sense. The concept value exists in a plethora of different fields (Khalifa 2004).

In the following, we review some definitions pertinent to value in the context of construction projects, notably from within economics, marketing and those employed within the LC community.

Before considering different definitions of value, it is important to differentiate *value* from *values*. According to Schwartz and Bilsky (1987), there are five features common to most of the definitions of values found in literature, which they sum in a definition of values being *" (a) concepts or beliefs (b) about desirable states or outcomes (c) that transcend specific situations, (d) guide selection or evaluation of behavior and events and (e) are ordered by relative importance."* In contrast to the concept of values (plural), value (singular) is the outcome of an evaluative judgment (Holbrook 1998). These two concepts are often confused (Sánchez-Fernández and Iniesta-Bonillo 2007). It should also be noted that some authors will not subscribe to this distinction between *value* and *values* as terms. For example, Midgley (2016), looking at value conflicts from an operation research point-of-view, writes that *"[v]alues, in this theory, are not general principles or virtues (e.g., kindness and modesty), but are concerned with the purposes that people pursue in action"*.

Value is a central concept within the field of economics. Economists traditionally refer value to utility or marginal utility when considering value and consumer behaviour (Bowman and Ambrosini 2000). According to this, consumers spend their income to maximise the satisfaction they obtain from products. Furthermore, total utility denotes the satisfaction gained from being in possession of a commodity, while marginal utility refers to the satisfaction that someone receives from getting one extra unit of a good, or the satisfaction lost by giving away one unit. However, these traditional views have been critiqued for being: (1) too simplistic (Kahneman and Tversky 1979), or (2) of limited use to production science as they focus on the distribution of scarce resources (Rooke et al. 2010a)."

More relevant definitions of value can be found in the marketing literature. In a seminal paper by Zeithaml (1988), an exploratory study amongst consumers revealed four different understandings of value: *(1) Value is low price, (2) value is whatever I want in a*

product, (3) value is the quality I get for the price that I pay, (4) value is what I get for what I give.

The two last definitions differ in that (4) considers all get and give components, while (3) only considers monetary cost and the direct quality of the product. Thus, this definition ignores other *give* components, such as the time and emotional costs required in acquiring the product, and *get* components, such as experience.

According to Zeithaml, each of these definitions has their counterpart in trade or academic literature. She argues that all of them can be in one overall definition: *"Perceived value is the consumer's overall assessment of the utility of a product based on the perception what is received and what is given."*

Kelly (2004), analysing value management in construction projects, states that the most common definition of value in literature expresses value as the relationship between cost and benefit — essentially the same as expressed in definition (4).

The original Lean definition of value is considered to be that of Womack and Jones (1996), stating that *"value can only be determined by the ultimate customer. And it is only meaningful when expressed in terms of a specific product (a good or service, and often both at once) which meets the customer's need at a specific price at a specific time."* The first part of the statement, addressing the question of value only being determined by the ultimate customer, concerns the subjectivity of value and whose value we should seek to maximise. The last part, however, expresses the temporal dependence of value judgment. Ignoring these, what we then are left with is value being determined by the "*the customer's need at a specific price*." Meaning value is a function of the customer's fulfillment of his needs (how it benefits him or what he gets) and what he has to pay to get those needs fulfilled. If price is interpreted to include more than just monetary cost (e.g. time cost), then Womack and Jones's definition corresponds to Zeithaml's fourth definition; *(4) value is what I get for what I give.*

Few of the value-related papers presented through the LC-community include what we perceive to be any clear base definition of value. In about half of all the reviewed papers, value is used as a term without it being properly introduced or defined. These typically use the concept of value for introducing some kind of method or tool. Furthermore, several of the papers lacking an explicit definition of value address value generation. In the LC community, value generation theory from the Transformation-Flow-Value (TFV) model (Koskela 2000) can be seen as a starting point of the research on value, and research is widely influenced by this (Salvatierra-Garrido et al. 2012). However, Koskela mainly considers the importance of delivering value from production systems and how such systems should be managed to do so (Drevland and Svalestuen 2013). With regards to what value is per se, Koskela simply defines it as fulfilling the customers' requirements.

Some authors have employed definitions from other fields such as marketing (e.g. Lima et al. 2008; Miron and Formoso 2010) and economics (e.g. Andersen et al. 2008; Bølviken 2006). However, little of this has gained traction with the community at large. Of the papers that have anything that could be considered a clear base definition of value, the majority defines value in some way that could be said to correspond to Zeithaml's second definition of value; '*value is whatever I want in a product.*' Orrechia and Howell (1999), for example, state that *"'What the client wants' defines value."*

The propensity to regard value as only concerning need fulfilment is also clearly evident in papers that refer to Womack and Jones' definition, but only using part of it, most notably ignoring the price element (e.g. Whelton and Ballard 2003). Another sign of this tendency can be seen in papers that employ the term 'value for money' when including the cost aspect of value (e.g. Bertelsen and Koskela 2002; Orrechia and Howell 1999). In these papers, 'value for money' is typically equated to benefit per dollar spent.

Here, it is worth noting that economists consider 'value for money' the colloquial term for what they refer to as consumer surplus (Bowman and Ambrosini 2000). Such analysts define the term consumer surplus as the gap between total monetary value and price, where the total monetary value is the price the customer is willing to pay for the product based on his valuation of what he is getting. In other words, 'value for money' does not denote what get you per dollar, but rather what you get above and beyond the balance point of give being equal to get. Conversely, *producer surplus* is what the supplier gets above and beyond the minimum amount they would be willing to accept for a good or service (Mishan 1968).

A similar phenomenon can be observed in the LC community's adoption of the Choosing by Advantages (CBA) decision-making methodology. The crux of the methodology is that it compares and ranks the advantages different alternatives have compared to the each other, rather than pre-weight and score factors (Suhr 1999). The scoring given is referred to as Importance of Advantage (IoA). When making a decision, the total IoA for each alternative is considered versus the cost of each, in other words considering what one gets versus what one gives. In LC papers this is referred to as trading cost versus value (see for example Arroyo et al. 2013; Schöttle et al. 2017), again showing how value is seen a get or benefit only related term. Jim Suhr, the CBA methodology's creator, does not himself ever use the word value in this sense. In Suhr's seminal book on CBA (Suhr 1999), the only value related term that is introduced is that of *values*, which is defined as "deeply held beliefs", that is in accordance Schwartz and Bilsky's (1987) definition of values as given above. While the term value occurs in other context in the book, it is then in accordance with common language usage of the word, rather than as a part of the CBA terminology.

Holbrook's (1998) definition of value differs from the ones presented so far. He defines consumer value *as "an interactive relativistic preference experience"*. According to our understanding of Holbrook, *interactive* refers to the value stemming from the *experience* of the subject interacting with the product or service in question. Furthermore, he states that *"such consumer value refers to evaluation of some object by some subject"*. Consumer value is thus not inherent in the product but resides in the consumption experience. The *preference* part of the definition entails it involving a preference judgment between two or more options. Finally, *relativistic* relates to three elements. Value is *comparative* – involving preferences among objects; *personal* – varying across people; and *situational* – specific to the context.

Holbrook's definition covers several aspects lacking in the others. It has, however, some shortcomings that, in our opinion, prevent it from being a solid definition of value in the context of construction projects. Firstly, it is not particularly intuitive. The expression *"an interactive relativistic preference experience*" is rather obtuse, not helped by the fact that semantic elements can be said to be overlapping. 'Relativistic,' for instance, includes a comparative element which equally can be found in the term 'preferential. Also, in the

sense that Holbrook uses it, 'an interactive experience' is somewhat of a tautology. *Interactive* indicates something that one would actively partake in. In colloquial terms, most people would probably not consider sitting passively in a cinema watching a movie an *interactive* experience. However, according to how Holbrook defines the term, it is.

Overall, we consider the most significant weakness to be the omission of anything concerning the get and give aspects of value. This is to some degree covered in the topology part of Holbrooks work, but even there it is barely touched upon. This has, in fact, been criticised by other authors (Sánchez-Fernández and Iniesta-Bonillo 2007).

Nonetheless, the following analysis leans heavily on the insight presented by Holbrook. The reason for this lies in its completeness, that is, its openness to the complexity of the notion. Rather than repeating Holbrook then, we envisage to deepen the analysis and strengthen the conceptual framework by identifying nine tenets through which the concept of value can be understood.

Nine tenets

Value is a complex term. To mitigate some of the complexity, we examine different aspects of the nature of value on a decomposed and a fundamental level, expressed through nine tenets.

The word *value* has several meanings in the English language. The first tenet scopes the base meaning of the term and defines value at the most fundamental level. As such, it should be considered an axiomatic statement upon which all of the other tenets are contingent. Meaning that the other tenets are nonsensical if the first tenet is false.

T-1. Value is the result of an evaluative judgment

Values are different from value. However, values are important in the evaluative judgment. Based on the previously presented definition of values, as given by Schwartz and Bilsky (1987), it should be evident that someone's values will guide their value judgment. Thus:

T-2. Values guide value

An example of values in this sense could be "conserving the planet". This could lead to making greener choices for a building. However, such judgments require knowledge, both of the context and of the product or service being evaluated. In the case of greener choices, this includes knowledge that global warming and such is a problem, knowledge about how buildings contribute to this in general, and specific knowledge about the solutions being considered. Said more succinctly, evaluation is based on knowledge (Lewis 1946), leading us to the third tenet:

T-3. Value is dependent on knowledge

The values shaping this judgment belongs to someone or some entity. Holbrook (1998) refers to value being "personal". However, we feel that this term is inappropriate when considering value for an organisational entity like a company. Therefore, the fourth tenet is given as:

T-4. Value is particular

An evaluative judgment is never performed in a vacuum. In the human psyche, value is intrinsically tied to decision-making (Kahneman and Tversky 2000). How the concept of value is used in different fields highlight this. Anthropologists, for instance, typically use it

as a means to understanding why do people choose to act as they do (Graeber 2002). When faced with a choice, people will consider what it will cost them to do something and what they can expect in return, be it money, social standing, a good feeling inside or other benefits. For marketers, value is a tool to understand and influence consumer purchase decisions. Such observations entail that value always concern choice, and comparing two or more alternatives to each other, leading to the fifth tenet of value, namely:

T-5. Value is comparative

What forms the basis of such value comparisons is debated. Various authors have offered different views on the subject. In the literature review leading up to this paper, we found that, outside of the LC community, researchers generally agree that both get- and give-components form a part of the value judgment. We would argue that if one accepts value as the result of evaluative judgment upon which decisions are made, then it is hard to imagine give-components not playing a part. That is, decisions being made purely on the basis of benefits, without costs being considered at all. This is expressed in the sixth tenet as:

T-6. Value can be decomposed into a set of get-and-give-components.

How get-and-give-components are evaluated, however, is contested. Sánchez-Fernández and Iniesta-Bonillo (2007), cataloguing the different approaches to perceived value in the marketing literature, distinguish value as a one-dimensional and a multi-dimensional construct. A multi-dimensional value construct means that *"value is an aggregate concept formed of several components",* while a one-dimensional value construct is a singular assessment. For the latter, there may be several factors considered in the value judgment. However, value is, in this case, not the sum of its parts as the former suggests. Rather all the factors are evaluated at once simultaneously leading to a single-point result.

Based on this distinction, we would argue that value is best viewed as a one-dimensional construct. Value being a sum of its parts entails that each part could be evaluated separately and without consideration to the others. Partial consideration of value only makes sense if value can be said to be linear. This notion has been contradicted by Kahneman and Tversky (2000) in their seminal work leading up to Prospect theory. Thus, we formulate the seventh tenet as:

T-7. Value is not summative.

Whatever the give and get components, we would argue that they always will be tied to experiences. For example, one could consider a building's aesthetics as a get component. However, this consideration does not capture the fundamental complexity of aesthetic judgement. Its benefits stem from its ability to evoke emotions and influence state of mind in occupants, visitors and others. For an individual homeowner, this could be an end in and of itself. As stated by Holbrook(1998) in the context of consumer value, "value resides *not* in the product purchased, *not* in the brand chosen, *not* in the object possessed, but rather in the *consumption experiences".* Thus, when it comes to building aesthetics, purchasing or owning a beautiful building brings no benefit if that beauty is never experienced by anyone, only the experience of taking in that beauty contributes to the value of the building.

In the context of companies, rather than individual consumers and clients, experience should be understood slightly differently. A company is not a sentient entity

and cannot be said to appreciate and experience in and of itself. Rather, for a company, the experience will serve some higher purpose. For example, Rybkowski (2009) shows how pleasing buildings facilitate faster patient recovery in hospitals. Thus, we can say that humans will pursue experiences that enhance the quality of life for themselves or people they care about; organizations will pursue experiences that will further their objectives (whatever they might be). This leads us to the eighth tenet:

T-8. Value is experience based

Some of the major get or give components will often be expressed in monetary terms, such as investments costs, maintenance cost or rental income. Can money be said to be an experience? Not directly, especially since the limits to using pecuniary terms as an actual measure of value has been highly debated throughout modernity (Lohne et al. 2017; Nussbaum 2010; Sandel 2013). Money is, however, a means to very many ends. Thus, it can be considered a placeholder for experience.

An important corollary to this is that during the value judgment not only the experiences gained from interacting with the objects in question are considered, but also potentially gained or lost experiences outside of the scope of what is being evaluated. For example, if an owner chooses to put more money into a construction project to improve some aspect of the building, he will at the same time forego the option of investing the money elsewhere with the accompanying experiences from that. What other options are available depends on the context. Corollary proof to this can be found in what Soster et al. (2014) call the *bottom dollar effect*. For consumer purchases, the perceived monetary sacrifice is greater when available funds are low, leading to a lower satisfaction, or perceived value.

Holbrook (1998) refers to this as value a being *situational*. We choose to express the ninth tenet as:

T-9. Value is context dependent.

We believe the nine tenets presented here are universal and applicable to any situation where the word *value* is understood to mean something in line with the first tenet, that is, value is the result of an evaluative judgment. Based on the tenets and the discussions around them we can arrive at the following definition of value:

> *Value is the result of an evaluative judgment. This judgment is guided by values and based on the evaluator's knowledge at hand. It is always based on comparing two or more alternatives in a given context. This context envelops all get and give consequences for a particular party from a decision made on the basis of the value judgment. The get and give consequences are always in the form of gained or lost experiences, or expressed in monetary terms as a placeholder for experiences. The consequences are not summative; the value judgment is done by considering them all at once.*

Implications

Value for whom

Value is particular. Whose particular value we should concern ourselves within construction projects is a complex matter(Drevland et al. 2017). Different authors have

offered different opinions on the matter. For example, Salvatierra-Garrido et al. (2012) have argued that the value for the wider society has to be considered, while Drevland and Svalestuen (2013) argue that only the value for the paying client is of consequence. According to Bertelsen and Emmitt (2005), we need to consider the client as a complex system. It is beyond the scope of this paper to fully tackle this subject. However, some reflections are warranted.

The first tenet states that value is a result of an evaluative judgment. This implies that there must be a judge (or a panel of judges acting in unison). If we go beyond considering the client as a single point, this becomes challenging. If no judge is formally appointed, the project manager, architect, or whoever is handling the value management process, will be in a position of *de facto* judge. We would argue this is not something anyone in such a position should do on their own volition, at least without clear guidance from the customer. Thus, on any construction project, there should exist a clear notion of who is the supreme value judge.

Perception of value

Some authors argue that all value is perceived value and that any concept of true value is nonsensical. This might be true if considering value through a marketing lens. The core concept of marketing is the transaction (Kotler, 1972). Arguably, this implies that the focus is on one customer making a buy-or-no-buy decision based on the value perceived at a single point in time. Thus, perception is everything.

Conversely, in construction, the concern should be delivering actual value over time. The buy-or-no-buy decision is typically made long before the value to be delivered has been decided in detail. In this context, true value can be a beneficial concept. To define true value, we first need a definition of perceived value and define it as:

- **Perceived value** – The value of something for the perceiver. How a product or service is evaluated by someone will depend on their values and the knowledge they possess

When defining true value, the salient point in the above definition is the one based on the seventh tenet, that value is dependent on the evaluator's knowledge at hand. Logically, flawed knowledge will lead to a flawed perception of value.

Perfect information is a concept originating in game theory. McConnell (2000) defines it as "the state of knowing everything there is to know about a specific problem or decision situation". However, information and knowledge are not the same. Information is raw data. In an evaluative situation, knowledge entails understanding the consequences of that information. We, therefore, propose to define true value as:

- **True value** – The value that would be perceived if the perceiver had perfect knowledge.

The relationship between knowledge and information is expressed by Brookes(1980) in his fundamental equation: $K[S] + \Delta I = K[S + \Delta S]$. When information is added, a knowledge structure will change to a new modified structure. According to Bawden (2011), this equation is *"a description of the information communication process as it affects one individual's knowledge*". The effect of the information may vary according to the knowledge structure to which it is added. One consequence of this is that past experiences

and corollary knowledge will greatly impact someone's ability of translating information into usable knowledge.

Maia et al. (2011) argue that it is impossible for someone to predict the evaluation of someone else accurately. This might be, considering this would also entail accurately predicting the knowledge and values they possess. However, we would argue that someone who is sufficiently knowledgeable about someone else and their situation might be able to give an estimate of the value of a product or service for them that is closer to the true value for them, than what they themselves perceive the value to be. Case in point, an industry practitioner will most likely be better able to gauge a buildings' fitness-for-purpose than a (non-professional) client. This is due to being better able to translate the available information into relevant knowledge. Based on this we define estimated value:

- **Estimated value** – The value for someone estimated by someone else. Value is always seen from the point of view of someone, but can accurately be estimated by someone else if the estimator is sufficiently knowledgeable about the values of the subject he is estimating the value for and their context.

The subjective-objective dichotomy

One of the most significant conundrums of value lies in the subjective-objective dichotomy, that is whether value is subjective or objective. None of the tenets addresses this directly. However, taken all together it can be inferred that value is in fact subjective.

Value being the result of an evaluative judgment made by someone does not automatically make it subjective. Making a judgment of how much liquid there is in a measuring cup would be considered an objective matter. However, deciding whether beer or water is the best liquid to ingest cannot be objectively decided. It will be dependent on someone's values and their context. For example, a teetotaller will never drink alcohol, and most people will stay sober at work.

Only if we assume true knowledge, including knowledge about the particular person or entity's values, could value ever be considered to be objective. This is, in real life, an impossibility. Thus, value is subjective.

The time aspect of value

Several authors have pointed out that value varies over time (e.g. Emmitt et al. 2004; Salvatierra-Garrido et al. 2010) and time is also a part of Womack and Jones'(1996) definition of value. None of the presented tenets includes anything explicit about time. However, time is implicitly included.

Value being time-dependent can be understood in two different ways. Firstly, value is the result of an evaluative judgment that is context dependent. This context will change over time. Therefore, value judgments made at different points in time will be different. Secondly, the benefits and costs related to a building come over time. For example, while the initial investment cost is substantial, the operating costs of the building over its lifecycle will typically be five times that (Evans et al. 1998). Furthermore, the benefits, primarily rent or use of the facility, will be spread over the building's life-cycle. Each of the get-and-give-components of value can therefore be said to be a function of time.

Mathematical expressions of value

Mathematical expression of value are generally considered to be too simplistic (Rooke et al. 2010b; Thyssen et al. 2010). Thyssen et al. argues that they cannot encompass the theosophical thoughts on value, which entails a far broader defintion of value than what is being discussed in this paper. Furthermore, they show that rearranging the standard value equation would lead to "'value' multiplied by cost consequently should equal 'function'", which they argue is nonsensical. However, we would argue that mathematical expressions can be beneficial, as long as it is understood that they do not fully represent the complexity of value. An analogue to this is the previously mentioned Brookes' equation. It is an abstract expression (Fisher et al. 2005), and it should be evident that doing any sort of calculation on the basis of this is just not possible. Instead, its use lies elsewhere. Bawden (2011) refers to it as to as "*the basis for qualitative characterisation of informational behaviour*". We believe mathematical expressions of value can serve a similar function within the domain of lean construction.

The most common definition of value found in the literature is as the relationship between what you give and what you get, what you sacrifice and what you receive, or cost and benefit. Although this relationship is most commonly expressed relatively as value = benefit/cost, it could also be expressed in absolute terms as value = benefit – cost (Mkansi et al. 2011). This expression also circumvents Thyssen's critique of the standard mathematical expression becoming nonsensical when rearranged.

We would further change this, by expressing this relationship as $V = \boldsymbol{B} - \boldsymbol{C}$, where **B** and **C** represents the set of all benefits and costs respectively. However, in some cases, factors can either be a cost or a benefit. For example building energy. For most current buildings this is a cost, however with the current move towards so-called plus buildings, through solar power and other technologies, building energy could end up becoming a net befit. Therefore, we generalize these factors as Get-Give factors denote by **G**. Furthermore, if we consider the time dependency of each of the cost and benefit components and include that into the expression we get:

$$V_P = \int_{t=0}^{\infty} \boldsymbol{G}_P(t)\ dt$$

The value *V* for a particular party *E* equals the set of all get and give factors ***G*** for that party from now until eternity. However, it is essential to view this expression taking the seventh tenet into account. Value not being summative entails that all of ***G*** must be evaluated simultaneously. Meaning the different components that make up ***G*** cannot be evaluated separately and then summarizes.

Relationships to economist's concepts of value

While we initially discarded the economist's concepts of value as being simplistic and of limited use in production sciences, we believe it is worthwhile to situate them in relationship to the definition of value that we have given in this paper.

The economist concept of *exchange value* is intrinsically tied to transactions (Bowman and Ambrosini 2000). On either side this transaction there will be a buyer and a seller. Value for either parties will be determined by what they give and what they get. The formal transaction represents the overlap of these, as shown in Figure 1. The buyer gets a product or service that the seller gives in exchange for getting something in return. This something is typically money or something that can be equated to a monetary sum in

the open market. Thus, exchange value will is equal to this sum, and the overlap of the buyers Give and the sellers Get.

There are a couple of observations that should be made here. First of all, the formal transaction does not encompass all the Get and Give of the buyer and seller related to the transaction. For example, the transaction costs of both party be a Give that lies outside of the formal transaction. Secondly, since value is particular or subjective, the relative size of the two Get-Give overlaps can be perceived differently by the buyer and the seller, which is how transaction could amount to a good deal for both parties.

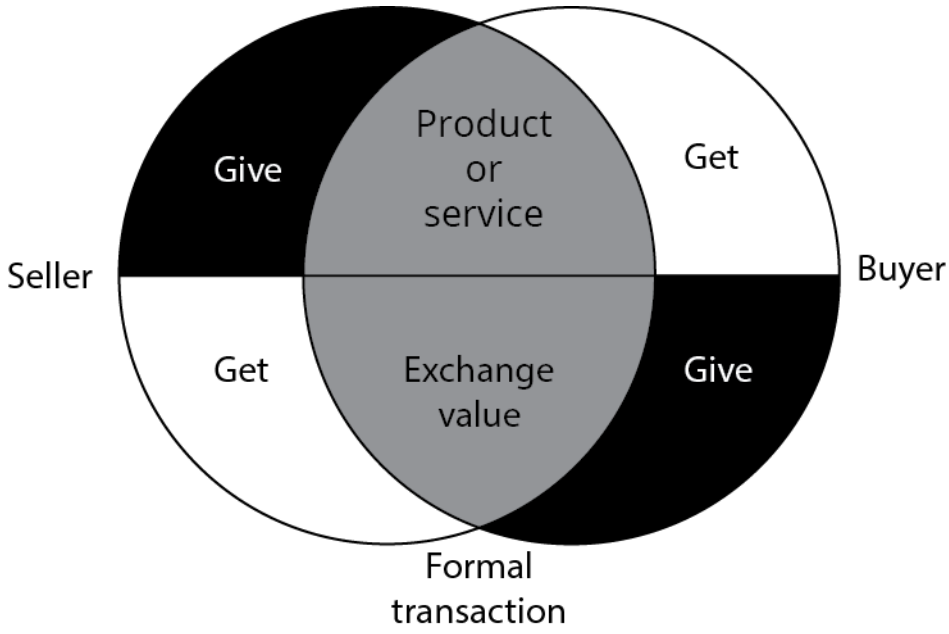

Figure 1 - Exchange value

Another economist concept closely related to exchange value, is that of market value. This is, simply put, the exchange value that can be obtained for a product or service on the open market.

The concept of use value, as given by economist, can be said to be the product or service that is transferred during the transaction as perceived by the buyer, and evaluated not as something to be resold on the open market, but instead as something that will serve a purpose for the buyer (Bowman and Ambrosini 2000). Thus, value for money, or consumer surplus as the economists refer to it, is the gap between use value and exchange value as perceived by the buyer.

Waste

Waste is a central concept within LC, closely tied to that of value. Without a tangible concept of value, waste is even more intangible (Bertelsen and Emmitt 2005). Womack and Jones (1996) define waste as any activity that consumes resources and creates no value. If Value=Benefit, however, any activity that produces even the slightest amount of benefit is not waste, no matter how large the monetary costs or other sacrifices required to obtain the benefit may be. Conversely, if value is defined as Value = Benefit – Cost, then any activity where the cost of performing it outweighs the benefits created from it would be

considered waste. This is, therefore, a much sounder definition of value in the context of waste.

Taking into account only the benefit side of value might be sufficient when considering construction. Construction activities can be deemed to be more or less binary in nature, in the sense that if an activity adds value, then it is required to yield the specified end-product, no matter how much it may cost to perform it. For example, if the building design specifies a column then that column has to be built, or the building will not be usable. Design, however, is an iterative process, where a marginally better solution always can be found (Meland, 2000 cited in Drevland and Svalestuen 2013). The placement and design of said column will affect load-bearing capacity, material usage, and flow of people in the building amongst other things. However, at some point in time, the cost of finding this marginally better solution will outweigh the benefits of it. By employing a definition of Value = Benefit - Cost, doing so would be considered waste by definition.

Conclusion

We would argue that the nine tenets, taken together as a definition, is not only more complete than previously presented definitions, but can also be said to envelop all of them with one crucial qualification. This analysis presents a much broader view of the comparative aspects of value than other definitions of value that we have found. For example, Zeithaml (1988) describes situations where customers consider one product to be superior to the other, but choose the inferior product due to financial restrictions. In our opinion, however, this fails to bring in the loss or gain of experiences outside of the direct scope of the product or service being considered. An implication of this is that going by the definition outlined in this paper, whatever choice is made in a decision situation, is the one that was perceived as having the highest value by the evaluator at the time the evaluative judgment was made.

At first glance, it might be difficult to see how we could claim to envelop the benefit only views of value. However, we would argue that formulations such as ‘what the customer wants’ is, in reality, a simplification. This ‘want’ is the result of a value judgment that necessarily also take sacrifice into account. At least if we consider ‘want’ outside of the context of wish lists and letters to Santa Claus; or a situation where the customer has so much time, money, or other sacrificial resources that the perceived sacrifice is negligible in the given context (for example, a wealthy person buying Heinz brand beans over the store brand). In the context of construction projects, neither of these are really applicable. However, ‘what the customer wants’ could entail that even though the sacrifice is not explicitly formulated or mentioned, it lies there implicitly. In other words, what the customer wants is contingent on getting it at a price where the perceived cost is lower than the perceived benefit.

Although we would argue that the above definition is relatively complete, it is not compact. In most situations, it is too voluminous to be practical. Therefore, it will often be better to use simplified versions, such as saying that value is what the customers want. However, this should be with the understanding that all of the tenets described would still apply.

The definition of value and the nine tenets that we have presented in this paper has no direct practical application, at least not beyond helping to foster a common

understanding of value as a concept. However, we would argue having a solid concept of value is an essential building block for developing tools and methodologies that will have a direct practical application. As an example of this, we will refer papers that have already published (Drevland et al. 2017; Drevland and Klakegg 2017), which builds on previous conference version of this paper.

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