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WHERE LEAN CONSTRUCTION AND VALUE MANAGEMENT MEET

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ABSTRACT

The lean construction (LC) community's key vision and goal is to provide value, yet they are increasingly challenged with understanding and dealing with the concept of value, with reports that value is one of the weakest points. Regardless of the previous studies and contributions already made on the concept of value in LC, the absence of a consistent understanding of value has resulted in misperceptions and indistinct boundaries with other construction value-related disciplines. Without a consistent understanding of value, the full potential of applying value-established concepts will not occur. Thus, the study of different concepts in construction will open new opportunities to deliver value in the future.

Literature reviewed only revealed a small number of interdisciplinary comparisons of Lean manufacturing and LC with value management (VM)/value engineering (VE) on value. Secondary data was used to present an in-depth comparison of the principal points of the current practice and theories of LC and VM, which are seen as ways to improve the delivery of value to clients and building users. The study revealed a range of similarities at a high level, which could easily point to an early conclusion that LC and VM are interchangeable, leading to the same goal of value delivery and shared misapplication of cost reduction techniques. However, a more detailed examination indicates significant differences in the philosophy and scope in different areas, including project timing, practitioner duties, and areas of practice which could complement each other.

Also the study identified that LC is a broader philosophy which covers more aspects than VM, it is evident that LC has advanced over the years towards discussions on the concept of value. The current work in LC on value relies less on other construction value-related disciplines such as VM, VE and partnering. Furthermore, LC literature still views value as a confusing concept associated with different interpretations, forming the basis

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of its understanding. The study established that value plays a central role in both LC and VM. Their combination could offer great synergy regarding the concept of value.

KEYWORDS

Lean Construction, Value Management, Value, Value-related disciplines, Integration.

INTRODUCTION

In recent times, there has been increased focus in current lean construction (LC) literature towards understanding the management of value, which is the end-goal of all construction projects (Emmitt et al., 2005; Salvatierra-Garrido and Pasquire, 2011). The LC community's key vision and goal is to provide value (LCI, 2016b). Although understanding, managing, and dealing with value has become a topic of growing importance when applying lean thinking by stakeholders, it is reported to probably be the most difficult to approach in managing construction projects and one of the weakest points of LC (Bertelsen, 2004; Bertelsen and Koskela, 2004; Emuze and Saurin, 2015).

Munthe-kaas et al. (2015) further argued that the management of value in construction is difficult and unpredictable due to the change of perspectives and nature of human beings. Recently, researchers have asserted that if value is not agreed upon initially in construction, then it will be challenging to maximise it (Drevland and Lohne, 2015). However, the agreement of value parameters and the use of the concept of creating value for the customer as the fundamental purpose of a project has contributed to the success of many projects. Additionally, the importance and achievement of improved productivity and client/user satisfaction has been recognised (Emmitt et al., 2005; Munthe-kaas et al., 2015; Salvatierra-Garrido et al., 2009).

The absence of a consistent understanding of value in construction has resulted in misperception and indistinct boundaries with other construction value-related disciplines. In agreement Emuze and Saurin, (2015) reports that discussions on value raise contradictions that impair a general understanding of the concept that could find alignment in contemporary thinking throughout a number of disciplines. Mossman (2013) asserted that value is a concept that requires continual updating and adjustment. In this respect, understanding the full potential of the management concept of value requires integration and iteration, considering its complex nature; thus, the study of different concepts in construction opens new opportunities to deliver value in the future (Kevin and Fadason, 2012; Salvatierra-Garrido et al., 2009).

The extensive progression of the concept of value in construction can be accredited to disciplines like LC and value management (VM). Seni, (2007), clearly emphasised the need to know about value in VM and other value disciplines. It is imperative for value to be explored in concepts such as partnering, VM, and other disciplines, like lean, as it has been found that the application of the concept of value is predominantly a part of these concepts (Wandahl, 2015). Literature reviewed only revealed a small number of interdisciplinary comparisons of Lean manufacturing and LC with VM/value engineering (VE) with the aim of identifying synergy in the way value is understood and delivered.

Previous researchers have documented that lean manufacturing and VM are established disciplines with complimentary merits and flaws; it is claimed that lean manufacturing tools and techniques may be used to improve VM studies and vice-versa (Nayak, 2006; IVM, 2015b).There have been many varied attempts to develop a clear understanding of the conceptual and practical perspectives of value in the IGLC community. A prevailing perception of value as a 'thing' as opposed to an emerging and dynamic phenomenon has had a varying and restricting effect on construction. High-level discussions and contributions of theories and management concepts, such as VE, VM, and lean thinking, etc., has led to fragmented individual perceptual representations of value. Consequently, the concept of value remains a rich field to explore (Salvatierra-Garrido et al., 2009). This paper considers LC and VM, as ways to improve the delivery of value to clients and building users.

METHODOLOGY

The study leading to this paper adopted an extensive and multi-disciplinary literature review in an attempt to bring together construction value-related concepts towards a consistent understanding of value according to the purposes of LC. A study aimed at comparing LC and VM views towards the concept of value was carried out to identify synergy in the way value is understood and delivered. To achieve a more general context to gain a more detailed understanding of the topic, a comparative study was conducted with high quality secondary data, which covered the intended population that focused on studies that shared the same view through identification of the main features of current theory and practice of LC and VM in the context of value in construction.

Several academic databases, including Scopus, Proquest, and Google Scholar, were searched in order to identify peer-reviewed journal articles, conference papers, and priority books. The search criteria primarily included the period of publication, key terms, and ranking criteria, with the period of publication set at 26 years to date because LC is a newer concept in construction management.

The articles selected to form the database of this study were chosen based on two considerations: context (i.e., construction/project management) and relevance (i.e., both academic/research papers and books related to the value concept). From a sample of 35 papers and books identified as related to value, the following concepts were documented: LC, VM, concept of value, value-based management, partnering, etc. This paper aimed at identifying a clearer path for a larger doctoral research study, where the result of this secondary data will be used to frame part of the questions for interviews to help confirm the initial findings. This study only considered secondary data due to lack of primary data.

THEORETICAL LITERATURE

VALUE IN THE CONTEXT OF LEAN CONSTRUCTION

A key vision and goal of the LC Institute is to provide value by achieving both customer and supply chain partner value throughout the project life cycle (LCI, 2016b).Womack

and Jones, (1996) stated value as the first principle of lean thinking. In LC, numerous definitions and terminologies of the concept of value have been identified in literature. According to Salvatierra-Garrido, et al., 2012, the LC perspective of value has been strongly influenced by the value generation view of the transformation flow value generation (TFV) model by Koskela. As stated in Koskela, (2000) each of these three concept (TFV) concentrates on certain aspects of production phenomenon: value-adding transformation on Transformation concept; non-value-adding activities on Flow concept; and control of production from the customer point of view on Value generation concept. Ballard and Howell, 1998 also argue that value is created through a process of negotiation between the customer's ends and means.

Additionally, according to Emmitt et al. (2005), value is grouped into internal and external values. While Macomber and Howell, (2004), stated that the basic prerequisite to understanding value is to properly understand waste. Lindfors (2000) advocated that value is the product/service that increases profit, decreases time and cost, improves quality for the company, and generates profit/value for the customer. Wandahl and Bejder (2003) introduced value-based management, which looks at different values to improve effectiveness and efficiency in the construction industry. Emmitt et al. (2004) proposed a three-phase model (value/process/operation) and identified six value parameters. Salvatierra-Garrido and Pasquire (2011) presented the first and last value model (F&LVM), which aims to widely visualise value in the construction sector.

Brimson and Antos (1999) suggested that value depends on the supply chain synchronisation, while Bertelsen and Emmitt (2005) argued that clients represent different interests from three main groups, who value different things at different times throughout the life cycle of construction projects: owner, users, and society. From extensive reviews of literature, Salvatierra-Garrido, et al., 2012 concluded that value is still unclear with various definitions contributing to its understanding with the subjective part of value looking more significant while the delivery of value is more focused at the project level. Emuze and Saurin (2015) asserted that little importance has been given to a constant and internally coherent understanding of value in LC. There have been steady and substantial contributions to the development of value from the LC community through a multitude of relevant aspects.

VALUE IN THE CONTEXT OF VALUE MANAGEMENT

According to Kelly et al. (2015), the concept of value reported in volumes of literature by VM researchers shows a reasonably steady approach to its meaning. The most agreed upon expression is that value is stated in the context of units of function, which may be obtained for a unit of cost, as it is most usually expressed as a ratio of function to cost. The VM practitioners have associated value with user requirements, purpose, perception, and influence. Dell'Isola (1997) presented value as 'the most cost-effective way to reliably accomplish a function that will meet the user's needs, desires, and expectation'. Guiwen et al. (2006) argued that value considers the satisfaction of the user requirements, which are determined by their decisions, expectations, and views for cost paid. The comprehension of value is influenced by a chosen combination of benefits compared with acquisition costs.

Kelly et al (2015) assert that the key weaknesses and difficulties of VM have been acknowledged at the implementation stage of projects and is seen to be declining due to its cost-cutting legacy, one-off intervention predominantly at or around the concept and sketch design stages, with its image creating confusion with other management techniques dealing with value. Over the years, VM have acknowledged other concepts such as benefit realisation, value based thinking style of management etc. However, it can be argued that VM has focused towards the relationship between the user-required functions and cost.

FINDINGS

The principal points of current theory and practice of LC and VM are compared in tables 1 and 2 below. The references for Tables 1 and 2 are listed with numbers. The numbers in the tables refers to these Authors: (Table 1& 2 in Abdelhamid, 2008 [1]; Cell and Arratia, 2003 [2]; Drevland and Lohne, 2015 [3]; Emmitt et al. 2004 [4]; EN, 2000 [5]; Forbes and Ahmed, 2011 [6]; Gui Wen et al. 2006 [7]; Hines et al. 2004 [8]; IGLC, 2016 [9]; IVM, 2015b [10]; Kelly and Male, 1993 [11]; Kelly et al., 2015 [12]; Koskela, 2000 [13]; LCI, 2016a [14]; LCI, 2015 [15]; LLC, 2015 [16]; Leinonen and Huovila, 2000 [17]; Nayak, 2006 [18]; Norton and McElligott, 1995 [19]; Ogunbiyi et al. 2011 [20]; Salvatierra-Garrido et al. 2009 [21]; Salvatierra-Garrido & Pasquire, 2011 [22]; Salvatierra-Garrido, et al. 2012 [23]).

Table 1: Points of Similarity

	Value Management and Lean Construction: shared attributes
Objective	Value creation throughout the whole life cycle. [18], [15]
Origin	1940's manufacturing – influenced by post-WW2 resource scarcity [12]
Techniques	Each has a set of recognised tools and techniques accredited exclusively to themselves i.e. lean tools, VM tools. But use other tools as appropriate [20][18][6]
Environment and Culture	Collaborative, multi-skilled team environment supported by higher management. Process requires innovation and the involvement of stakeholders in the development of value propositions.[18][12],[6]
Approach	Acknowledge the importance of innovation, benefit realisation, whole life value, asset management, projects, programme & portfolio management, soft & hard value, value-based management, and consider impact on society**. [12] [23]**
Usage/ Application	Applicable in various sectors of the economy beyond manufacturing and construction including government, transportation, business, communication, and services with reports of enhancing other practices. [10] [15]
Mis-use/ Application	Frequently the name is used to describe cost reduction activities and tools used to reduce inputs with a corresponding reduction of outputs [8] [12]
Understanding of Value	Lack a sound theoretical explanation of value but consider it in terms of objective, subjective, use, esteem, cost and exchange [7] [23].[17]
Customer Focus	Understand customer as a combination of commissioners and stakeholders[12][18]

Table 2: Points of Difference

	Value Management	**Lean Construction**
History	The founding practice was developed by Lawrence D Miles for GE in the USA.[12]	The founding practice was developed by Taiichi Ohno for Toyota in Japan.[6]
Focus	Service oriented and push driven.[12]	Philosophy oriented and pull driven. [6][2]
Structural model	Emphasis on issues on: Value generation [1]	Emphasis on issues on: Transformation of input to output, Flow of work and Value generation [13]
Process	Has a formal standard (BS EN 12973). VM is an extract of the delivery process and commissioned separately to support the project delivery model. It is practiced and operationalized through interventions called value studies at specific phases (value opportunities) and time. It is often used to correct budget overruns [5][12] [21]	No formal standard. LC is a project delivery model in its own right and is chosen rather than commissioned. However, individual tools and techniques are often commissioned separately as project correction interventions. It does not have specific value opportunities, as value is a continuing focus.[6]
Learning	It deliberates on problems and learning is between projects.[12]	It deliberates on process flow, and learning is a continuous improvement within projects across the whole process.[6]
Scope	Manages design and feasibility studies, which improve the value for money of the end product in use (building or structure) through design optioning and redesign in specific workshops. [11] [21]	Manages scope and recognises the delivery process during design and construction. The difference between desired value and realised value is minimised through the elimination of value loss. Considers control and monitoring of value delivery e.g. built in quality, Last Planner® System etc.
Value Delivery	Value achieved through the relationship and balancing of cost, time, and quality. [12][19]	Value achieved by reducing value loss (waste) without a trade-off of time, quality, and cost. [1][14] [17]
Customer Focus	Customer is understood as a series of values and value systems: client's value system, the client's project value system, corporate and business values, project value system, practitioners' value system, consumers' (users'/customers') value systems and stakeholders' value system. [12] [18] [23]	Customer is understood in three ways; External customers paying for (and affected by) services and goods Internal customers receiving services and goods between departments/sections of an organisation Next customer in a process considering the hand over between tasks Customers are recognised as dynamic across the whole life process. [18] [22]
Research	Theoretical development is limited and the view of value and has not really expanded from that developed by Miles i.e. Value is the ratio of function to cost. Other studies	Much research has been carried out to understand value in lean for example the transformation, flow, value generation model; first and last value; value based management; external and internal value; process and product

	surrounding value have concentrated on the relationship between the user-required functions and cost, including value based thinking. [7]	value; value, process, and operation model; the five features of value; and recently the nine tenets of value and so on.[3] [23]
Early Project Stage	VM contributes to a clear customer perspective of value from the early stage of projects. [22]	LC generally acknowledges its lack of addressing the concept of value at the early stage of design. Recent advances include lean design, lean and BIM, integrated project delivery and target value design [4]
Implementation Project Stage	It is reported to be weak at the implementation stage. [12]	Many examples of lean applied within on-site activities exist, the theoretical framework behind lean construction advocates that value is defined in design and lost in the process.[23]
Academic Support/ Body	No academic/theory developing body exists purely to support VM – development is embedded in more general bodies such as CIB, ARCOM etc. The Institute of Value Management (IVM) is largely industry/practice led consequently the knowledge base for VM is practice led.	The International Group for Lean Construction (IGLC) as an academic led body for the development of LC theory to which practitioners make a strong contribution. The IGLC pre-dates the Lean Construction Institute (industry body) and its global satellite organisations. The knowledge base for LC is theory led. [9]
Process Drivers	Value study participants are the primary drivers of value proposals but are not always engaged in the project decision making process. [12]	The people engaged in the process and encouraged to look for ways to enrich the project processes directly. [6] [16]

CONCLUSIONS

This investigation recognises a range of similarities at a high level (Table 1) that could easily point to an early conclusion that LC and VM are interchangeable, leading to the same goal of value delivery. This is most evident in their shared misapplication as cost reduction techniques. However, a more detailed examination indicates significant differences in philosophy and scope in different areas, including project timing, practitioner's duties, areas of practice, and project application. Furthermore, both LC and VM have recognised each other in the past. The ongoing trend of linking VM and lean in topics of discussion for value practitioners is evident at conferences both in the UK (IVM, 2014; LCI UK, 2015) and in the US (SAVE International, 2015a; SAVE International, 2015b). With the institute of value management UK appointing a Lean Construction Group Liaison (IVM, 2015c). Both LC and VM share common origins and methods from the manufacturing sector (IVM, 2015a).

Some known subsets of VM, namely value analysis and VE, have been used in target costing in the manufacturing industry to attain additional cost reductions (Womack et al., 1990). Further, VE and LC have been reported to systematically apply methods to processes/services in order to deliver an enhanced product/service to the customers that fulfils their needs in a timely and cost-effective way with the main aim of maximising value and minimising waste. In addition, LC practices intend to complement rather than

compete with VE (Lehman and Reiser, 2004). Also, there have been suggestions of using VM for the practical application of the value generation view on production (Koskela, 2000). LC is a broader philosophy which covers more aspects than value management, it is evident that LC has advanced over the years towards discussions on the concept of value. The current work in LC on value relies less on other construction value-related disciplines such as VM, VE and partnering. Furthermore, LC literature still views value as a confusing concept associated with different interpretations, forming the basis of its understanding.

Although both lean and VM, when applied individually, are beneficial, their combination offers great synergy regarding the concept of value (Cell and Arratia, 2003). The study established that value plays a central role in both LC and VM. Future study should investigate empirically their possible integration towards identifying synergy in the way value is understood and delivered. Which is the next goal of the authors. Moreover, if the view of no single approach being greater in respect to others is accepted, it can be easily established that there may be theories, methodologies, and techniques in each discipline that could support the others (Nayak, 2006). Salvatierra et al. (2008) affirmed that the integration of the concept of value through exploration of VM and lean thinking would add value for delivering satisfactory solutions.

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