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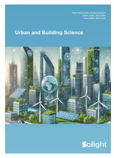

Review

A Lean-Integrated Conceptual Framework for Value Optimisation of Construction Project Briefing by Enhancing the Client Needlessness

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Abstract: The construction industry continues to face significant challenges in project value optimisation in the early briefing stage, which leads to rework, cost overruns, and value loss. This study aims to address the neglect of cilent's "needlessness" in the value definition process during the early briefing stages and establish a structured framework to optimise project value from the outset. A deductive methodology is adopted, by integrating Value Management, SMART method, Lean Construction, and behavioral decision-making via a systematic literature review (SLR) and conceptual modeling. The framework is theoretically validated through logical consistency testing and expert review. Key findings reveal that formalising "needlessness" identification can effectively reduce briefing stage waste compared to conventional VM practices. The proposed framework enhances the SMART VM methodology by explicitly incorporating "needlessness" identification to form a protected "Value Boundary" and introducing a quantitative feedback mechanism to objectively close iterative briefing cycles. This framework advances VM theory by formalising "needlessness" as a core component, extends LC application to early project phases, and provides a practical tool to align stakeholders, reduce waste, and guarantee project value.

Keywords: value management; lean construction; project briefing; needlessness; conceptual framework; SMART methodology

1. Introduction

1.1. Background and Context

The construction industry is undergoing rapid expansion driven by societal changes. It is a key indicator of economic growth and directly impacts social stability [1]. However, in practice, the final product frequently fails to meet expectations for structural integrity, functionality, or user satisfaction accompanied by rework (accounting for up to 30% of total project costs [2], waste and cost overruns of 20–30% on average [3]. Lean Construction (LC) has gained widespread attention and adoption from both academia and industry for its focus on maximising value and minimising waste, with successful implementation relying on maximising value and wasted elimination [4]. Its successful implementation largely depends on the clear definition and effective management of "value". Value Management (VM) provides a structured process to clarify project functional benefits and align them with the client's value system [5]. Given construction projects involve multiple stakeholders, including employers, designers, contractors, end-users, etc., VM also helps clarify roles, resolve ambiguities, and foster collaboration by enhancing client satisfaction and competitive advantage [6].

1.2. The Narrow Focus on Conventional Value Management

Current VM adoption in the construction industry remains inconsistent and limited. The practice and researches both approved that the construction project clients have emerged as the driving force of the industry's existence [6], but prevailing VM exhibits a fundamentally one-sided focus, that is it primarily elicits and fulfills expressed client needs [3] while lacking a structured mechanism to identify and eliminate non-value-adding requirements which is termed as "needlessness" generated by clients embedded in process. This oversight allows superfluous scope and waste to persist from project initiation, undermining VM's main goal of efficiency [1,5]. Previous researches stated that construction project clients are often unaware of their own requirements at the early stages and struggle to articulate their needs. By the same token, it is reasonable to assume that they are equally unaware of the embedded needlessness in their requests either. Consequently, without a proactive identification, VM exercises risk optimising an inherently inefficient value proposition.

1.3. Insufficient Understanding of Construction Project

Systemic inefficiencies within the construction industry can be traced to a long-standing reliance on generic project management theories, rooted in a misunderstanding of the unique nature of construction projects [4]. Construction projects are characterised by one-of-a-kind products, temporary multi-organisational collaboration, and location-based production resulting in complexities that make value definition and delivery challenging. In a pivotal shift, Koskela's TFV (Transformation, Flow, and Value) theory reframed understanding by positing construction as a combination of transformation, flow, and value generation processes [4]. Even this new paradigm not only provided a more accurate theoretical benchmark but also explicitly endorsed VM as a key methodology for project success, Bertelsen and Koskela subsequently argued that the concept of "value" itself remains one of the most challenging to redefine in construction management due to derivative uncertainties across multi-orginisation flows [7–9], which necessitates a further evolution in perspective [10–12].

1.4. The Purpose and Structure of the Study

Despite VM's potential for cost savings and collaboration enhancement, its effectiveness is constrained by two interconnected limitations. Firstly, conventional VM practice adopts a one-side definition of value, concentrating solely on eliciting and fulfilling client needs while systematically overlooking the identification and elimination of client "needlessness". Secondly, this shortfall is compounded by an insufficient understanding of the unique nature of construction projects, which makes the very concept of "value" profoundly difficult to define and manage effectively.

To address these gaps, this study aims to develop a Lean-integrated conceptual framework that synthesises LC's production perspective with VM's value optimisation goals formally incorporating "needlessness" into value definition. It aims to provide a structured tool that enables project teams to clarify what value is, as well as to explicitly identify and exclude what it is not, thereby establishing a protected "Value Boundary" that means delineating needs and needlessness. It seeks to explore how "needlessness" can be theoretically grounded in Lean theory and operationalised via VM tools in practice. As a result, this research is expected to enhance stakeholder alignment, reduce wasteful iteration, and ultimately guarantees and optimise project value in the critical briefing stage.

The paper is structured as follows:

Section 2 details the research methodology presenting how this study was carried out. Section 3 presents the theoretical foundations established by the core components (e.g., "Value Boundary"), and quantitative feedback mechanism. Section 4 discusses theoretical and practical implications, limitations, and comparisons with existing research. Section 5 concludes with key contributions and future research directions.

2. Methodology

The science of construction management is a combination of engineering and social science, thereby the research must be conducted to fit both purposes. It should include the study of how the system works (e.g., the construction process) and the human behaviour involved in such a system. However, the it is relatively difficult to have rigorous basis in social research for its ethical and practical reasons compared to engineering research, whereas the engineering research requires a rigorous basis following the scientific method [13], Therefore, this study adopts a deductive research approach aligned with the exploratory nature of construction management research that integrates engineering and social science perspectives. The methodology comprises four interconnected phases as summarised in Table 1.

Table 1. Research approach phases**.**

Phase	Activity	Purpose	Outcome
Theoretical Foundation	Systematic literature review of peer-reviewed articles	Establish the core concepts and identify the limitations in current practice.	Structured understanding of value, waste, and SMART VM limitations.
Framework Development	Conceptual modelling integrating SLR findings	Design a Lean-VM integrated model tailored to construction.	Draft framework with Value Boundary and quantitative metrics.
Operationalisation	Design of specific tools and protocols (e.g., Value Boundary Canvas, feedback metrics).	Translate the conceptual model into applicable	Practical tools for VM1/VM2 workshops (e.g., Canvas templates).
Validation Design	Theoretical validation and future empirical testing planning.	Assess validity and refine the framework.	Finalised framework with revised tools.

2.1. Theoretical Foundation

A systematic literature review (SLR) was conducted using Scopus, Web of Science databases and Lean Construction Institute website, adhering to the following inclusion criteria: (1) peer-reviewed articles/books on VM, LC, or project briefing articles published mainly between 2000 and 2025, (2) studies focusing on early-stage value optimisation, (3) publications in English with no less than 30% of sources from 2021–2025. The SLR targeted four domains as follows:

Lean Philosophy and LC. Core concepts were waste elimination, value stream mapping (VSM), TFV theory were refined using recent studies.

Manufacturing-Based Project Management. Transferable principles (e.g., iterative feedback loops) were extracted from manufacturing research, with recent cross-industry evidence.

VM Theories and Methodologies. Literatures were comprehensively reviewed within Traditional VM's limitations (overemphasis on "need" vs. "needlessness"), the integration potential of Lean and SMART VM methodology (a structured workshop-based approach widely used in VM) but lacking explicit waste reduction mechanisms.

Construction-Specific Project Management. Literatures were examined to understand the unique challenges and characteristics of the construction industry, including its fragmented nature and complexity (system behaviour, multi-stakeholder relationships, irreversible processes and component inter-dependency).

2.2. Framework Development

The framework was developed iteratively with each step grounded in the SLR findings and construction-specific characteristics. A conceptual model integrated "needlessness" into the value definition, enhancing the SMART Value Management methodology with two key enablers: (1) Value Boundary to safeguard project value and (2) quantitative feedback mechanism to objectively close iterative briefing cycles. The development process considered construction-specific characteristics such as irreversibility, stakeholder diversity, and product-system complexity.

2.3. Operationalisation

The conceptual model was translated into practical tools and protocols for use in VM workshops (VM1 briefing-phase workshop and VM2 design-phase workshop, including: Value Boundary Canvas as a visual tool for identifying and documenting needs and needlessness. Stakeholder Feedback Metrics based on execution and satisfaction scores to quantify alignment. Iterative Cycle Closure Protocol as a guided steps for reducing rework and scope creep.

2.4. Validation Design

The framework was theoretically validated through logical consistency testing and expert reviews involving academics and industry practitioners. Future empirical validation is planned via case studies across diverse construction projects (residential, commercial, infrastructure) to measure real world outcomes (rework, cost savings, stakeholder satisfaction).

3. Results

3.1. Value in Construction Context

3.1.1. The Definition of Value

The term "value" is an ambiguous word and widely used to describe a range of concepts. Over the past decades, no consistent definition of value or method for measuring value has emerged in the literature. From a customer perspective, Fallon defined value as the relation between benefits and price [14]. Porter suggested value as buyers' willingness to pay for a product or service [15]. From a marketing perspective, Ravald argued that value is a key element in relationship marketing and a reflection of a company's capabilities [16]. Project value depends on the efficiency and effectiveness of the project delivery process [17]. While value includes objective and subjective dimensions, even objective metrics are interpreted through the lens of individual values, making it inherently subjective [18–21]. It can thus be concluded that value is shaped by pricing, customer behavior and strategy, product utility, market conditions, and ethics.

3.1.2. The Connotation of Value in Construction

The dynamic nature of construction activities gives the term "Building" a dual identity, functioning both as a noun (the built asset) and a verb (the process of building). Consequently, within the construction context, value encompasses both final project entity and its production process. It performs a fundamental process that shapes the entire project lifecycle from initial conception to final delivery and operation [22]. Søren distinguished two types of value, one is product value which is determined by justified needs from customers, and another one is process value, which reflects project team collaboration [23]. Based on producer's viewpoint, Kelly's widely accepted formal V = F/C (where V = value, F = function, C = cost) highlights that value can be enhanced by improving functionality (F) while maintaining/reducing cost (C), or lowering cost while maintaining/enhancing functionality, or through a combination of both [3]. In smart city projects, social network data to is used to analyse citizens' value demands, which suggested the need for dynamic stakeholder value assessment in construction.

3.1.3. The Project Briefing Stage Is Critical for Value Realisation

The value of a construction project is not static or determined by a single factor; rather a dynamic concept collectively shaped through the lifecycle, with early-stage decisions exerting the greatest influence (almost 100% impact on final costs [3], locking in 70–80% of lifecycle expenses, Value definition involves identifying and articulating what constitutes value for various project stakeholders, moving beyond early financial metrics to include functional, economic, social, and environmental dimensions [24]. From conceptual planning and feasibility studies to design, tendering and bidding, construction, and further to operation, maintenance, and final demolition, each phase profoundly influences the ultimate value realisation with early-stage decisions exerting particularly significant impact.

3.2. Value Definition and Opportunities in the Project Briefing Stage

The project briefing stage is a critical period for making key decisions. Therefore, a clear value proposition can guide all subsequent decisions, and the dynamic process of definition itself presents four key value creation opportunities.

Stakeholder engagement is the foundation of a value co-Creation network. "Owner and stakeholder conditions" are the most influential factor for design management performance [25]. Research indicates that service providers play a role that extends beyond simple value co-creation, while clients are also capable of creating value independently of providers [26]. These finding underscores the critical importance of understanding and managing stakeholders. It implies that the briefing stage should involve not only owners and end-users but also designers, engineers, contractors, suppliers, and even community representatives, forming a multi-faceted value co-creation network. Studies on sponsored online communities demonstrate that clarifying the roles of different participants and identifying the facilitators and barriers to value co-creation can significantly enhance value creation outcomes [27], which becomes the evidence that needlessness should be taken into account at first.

Defining value constructs is to translating abstract concepts into tangible indicators. Clearly definition value constitutes the second critical value creation opportunity as it guides subsequent decisions in the briefing stage. Research in product development shows that customer value-driven planning based on Quality Function Deployment (QFD) in early project stages significantly enhances the value of the final product [28]. For construction projects, this means translating abstract concepts of value into specific, measurable indicators such as functional, economic, social, or environmental value. Therefore, the briefing stage should fully consider the specific social, cultural, and economic context of the project to define the most appropriate value proposition [29].

Establishing a rational decision-making process can ensure consistency in value definition. A clear decision-making process maintains defined value throughout the project lifecycle. Work progress, rework, redesign and innovation, and rescheduling are four key processes influencing project value, where rework arises from inadequate early planning and value management can account for up to 30% of total project costs [2], These aspects fails in economic losses and crises of trust and resource misallocation [7,30]. The briefing stage lays a foundation for these processes by planning in advance [31]. Thereby, proactively addressing these aspects can significantly reduce later changes and rework.

Fostering innovation and redesign is the potential beyond conventional approaches. Although innovation activities are typically implemented in later phases, their foundation is established during briefing stage. Open discussion and creative thinking identify value opportunities that traditional methods cannot achieve [31].The construction sector, in particular, offers robust potential for shared value co-creation that requires consideration during the briefing stage of how to integrate multiple resources to collectively create new value beyond traditional project boundaries.

To sum up the above statements, a clear definition of value during the briefing stage can guide subsequent project implementation, ensuring that project activities consistently align with achieving the intended value. Simultaneously, by identifying and eliminating waste, project teams can optimise resource allocation, improve efficiency, and thereby maximise value. Therefore, the core of value management can be defined as generating client-specified outcomes efficiently while minimising value loss throughout the project lifecycle.

3.3. Philosophy of Lean and Lean Construction

"Lean" is a philosophy originated in the manufacturing industry, with its five core principles being Value, Value Stream, Flow, Pull, and Continuous Improvement [32]. The very proponents Womack and Jones claimed that the core issue of lean thinking is value, including value specification, identifying value streams through customer-driven information pull [33,34]. It allowed the organisations to perceive the relations and approaches between business, production and process [11]. Lewis argued that the lean production in nowadays is a competitive strategy for the firm to achieve long-term flexibility of the capacity rather than the management fashion in the last century [35]. It has been concluded that lean implementation does not just focus on production [36], but also provides parallel strategic and in operational benefits. In addition, lean thinking offers a systematic and holistic standpoint that significantly shifts the trade-off between productivity and quality and brings out the rethinking of service operation [37]. From a product design value perspective, lean thinking's core elements include: (1) eliminate tangible and intangible waste of consumption throughout the process, (2) pull strategy through the supply chain/streams based on the customer's demand and order, (3) ultimate customers' preferences serve as the reference for product design, (4) enhance the information flow backwards to the design specialists for product definition, and (5) process-oriented control in a systematic view rather sub optimisation.

Lean Construction originated in the 1990s from the exploration of applying the Toyota Production System (TPS) to the construction industry. LC can be simply referred to the application of lean production adopted to construction based on the understanding of its distinctive features [38]. It was fundamentally proposed by Lauri Koskela with its core concept being the perception of production as a unified process encompassing Transformation, Flow, and Value Generation (TFV theory) [39] It emphasises eliminating waste, reducing variability, and shortening cycle times by enhancing standardisation and flexibility. Compared to traditional project management approaches, LC places greater emphasis on maximising customer value and minimising waste by optimising the entire production system [40]. It provides a new perspective to establish a continuously improving and self-perfecting delivery system for construction projects.

"Waste" is a core concept in LC. It is defined as any activity or resource that does not add value [41,42]. Recognising and eliminating waste is a critical pathway to maximising value, as value can be understood as the outcome that truly meets customer needs, while waste refers to any activity or resource that fails to contribute to such an outcome. Waste is now defined as the use of any resource beyond the minimum necessary, including human resources, materials, equipment, space, and time [43]. In construction projects, common types of waste include overproduction, waiting, transportation, over-processing, inventory, motion, and defects [44]. Each type of waste affects the overall value of the project in different ways, making it essential to identify and eliminate these wastes during the briefing stage to maximise project value [45]. In LC theory, waste also encompasses unused capacity in the production system or excess capacity used to complete the same work [46]. From this perspective, making client "needlessness" a form of waste must be addressed in early stages.

3.4. Construction Project as a Complex Product System

In the manufacturing product system, the function of a product is the sum of the function provided by individual units, and the parts are interchangeable that can be easily assembled. This intrinsic object-oriented nature allows products to be decomposed into smaller units based on the sub-functions that constitute the whole product system's function [47]. To interpret this sentence, it can be derived that the function embedded in the individual part (when it is not in the whole product) is the same as the sub-function expressed by the part when this part is integrated into the whole product system. This is referred to as the linearity of function development, which can be expressed by the following Formula (1):

$$F(product) = F(parta) + F(partb) + \dots + F(partn) \quad (1)$$

In contrast, the construction project is "a complex production of a one-of-a-kind product undertaken mainly at the delivery point by cooperation within a multi-skilled ad-hoc team" [9], in which production, a one-of-a-kind product, complex and cooperation are underlying characteristics. Distinguish from the manufactured components, construction projects involve complex systems of interconnected components contributing to the overall function of the building. The offered function works once the whole product is accomplished, which means that the function of a building is the integration of these parts into a cohesive whole. The required function of a building determines the design manner and quality standard, yet all of them encompass four different functional building components [7]: (1) the prefabricated element, (2) cast in-situ concrete and other materials are made on site, (3) pre-ordered materials for technical installation (pipes, cables, etc.) and (4) finishing element (windows, door, etc.) and coating materials.

3.4.1. Construction Project Is Not the Sum of Its Components

LC focuses on the unique construction physics, and differs from project management applied in construction project in several key aspects [42,48,49]. It emphasises flow and value considerations [50–52], while the traditional construction management take advantages of activity-based approach. It regards the project as linearly ordered sequences that take place top to down. However, the definition of the term "system" has proved this point of view is insufficient. The above four components are non-interchangeable and interdependent, which means the function is an integration of components, not a simple sum [53]. Subsequent components' functions depend on predecessors, with overall function expressed as Formula (2) listed below:

$$F(product) = a \times F(parta) + b \times F(partb) + \dots + n \times F(partn) \quad (2)$$

where: a, b … n represent the correlation factors, and each of them is dependent on the its contiguous parts.

Vice versa, the failure of one part or component will not cause the entire system to fail, rather it is the quality will be affected to reach higher criteria instead. The Leaning Tower of Pisa is the best example can express the co-dependent relationship, and it is the evidence approving that the decomposition of the building product as component-based is wrong.

3.4.2. The Irreversibility of Construction Process

Another noteworthy physics of construction project is that these components are sequentially installed at designated locations. This location-based immobility physically and potentially distinguishes the way of function decomposition. Example can be seen from the rework. When defects occur, the remedy work cannot totally reset the "added" or "changed" work to satisfy the intended sub-function or quality of this the part as it should be. As demonstrated above, the four types of building component are combined and forming each semi-product at each location, and the completed product is the result of the semi-product accumulation. It can be concluded that the construction process is irreversible, which further dictates that the product realisation process is irreversible as well as the product itself. However, this irreversibility has been largely ignored in practice and literature, with component-based thinking dominated in production management [54].

3.5. The Application of Value Stream Mapping (VSM)

Value stream mapping (VSM) is a powerful tool in LC for identifying and eliminating waste. Distinguishing value-adding from non-value-adding activities. It visualises the flow of information and materials in a project, and help a project team identify improvement opportunities in the briefing stage, such as redundant requirement collection, scope definition, inefficient planning, thus, enhances the quality and efficiency of the briefing process.

When treat the development process as a design-production-use chain, potential value is generated in design, embodied in flow phases and realised in the intended use by the client [12]. Hence, it is necessary to hold a holistic view through a project lifecycle in order achieve the realisation of potential value at the end. These processes can be specified in four phases: (1) the conceptual briefing phase, (2) the design phase, (3) the construction phase and (4) the operation and maintenance phase

Should the project team fail to establish effective communication mechanisms with stakeholders or be unable to promptly capture and interpret signals of any negative information and changes, the effectiveness of any "value management" techniques conducted based on outdated or fragmented information can be expected to be limited. Therefore, deepening the understanding of construction projects must be grounded in profound insights into the complex network of stakeholders, supported by continuous and dynamic requirements management and communication mechanisms. These barriers can be quantified by the number of potential communication channels, which increases exponentially with the number of participants according to the Formula (3). In contrast, during later project phases, the number of involved participants typically decreases. This reduction significantly lowers communication complexity and associated barriers.

$$N = \frac{n \times (n-1)}{2} \quad (3)$$

where: N represents the number of potential communication channels, n is the number of stakeholders.

With the progress of the work going to be more technical and objective, the information received by potential subjectivity is therefore becoming less. These value losses can be illustrated as the Figure 1 shows.

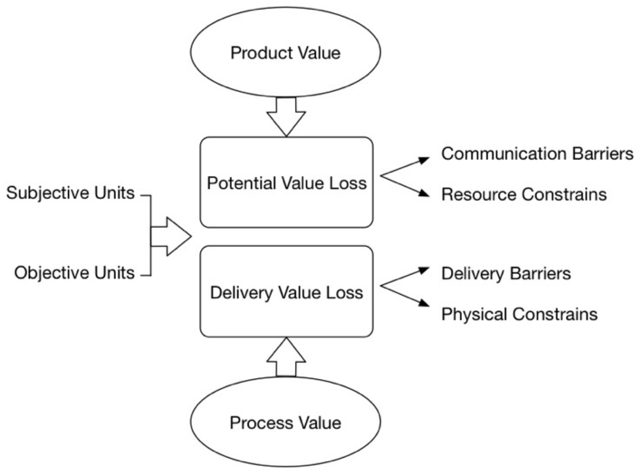

Figure 1. Value Loss in Construction Projects**.**

It illustrates two types of value loss that occur during the construction project lifecycle: Delivery Value Loss (*DVL*), and Potential Value Loss (*PVL*). DVL arises from inefficient communication, for instance, delayed feedback between clients and designers, and misalignment during briefing, PVL stems from unclear objectives or unaddressed "needlessness", for instance, client requests for unnecessary building features

There are two kinds two kinds of losses, subjective units and objective units respectively. As for subjective units, examples can be seen from client preferences, stakeholder attitudes, dominate PVL, as they reflect unquantified biases that lead to over-specification. As for objective units, examples can be seen from resource constraints, physical construction limits, drive DVL, as they relate to tangible inefficiencies in information transfer.

Implementing the above discussion into Abdual and Price's interpretation of the ability to influence final cost over project life [55], Figure 2 further illustrates the "ability to influence project cost" across phases, extending Abdul-Kadir and Price's classic framework. The briefing stage (start from pre-project phase) exhibits the highest influence (≈100%) on final costs, as decisions made here lock in 70–80% of lifecycle expenses [3]. VSM enhances this influence by identifying non-value-adding activities early: for example, mapping the flow of client requirements in briefing might reveal that 30% of collected information is redundant, which if eliminated, reduces subsequent design rework by up to 25% based on TFV theory "flow optimisation" principle [4].

Thereupon, it can be presumed that the Loss of Potential Value (*LoPV*) and the loss between each phase is relatively low, especially the inside subjective units. These two kinds of losses are in a certain range which is under control. In addition, if the value is optimised in the briefing stage, these two kinds of losses will be reduced. The rate of building depreciation is correspondingly lower, and it is largely in inverse ratio with the potential value. Hence, this view can be simplified and estimated as the Formula (4) indicating below:

$$UV = VB - LoPVp - \sum_{p=2}^{p-1} DVLp \quad (4)$$

where: Ultimate Value (UV) represents the value assessed after completion so that the depreciation is not included. VB stand for the Optimized Value at Briefing, $DVLp$ is the amount of value loss between the (p−1) th and pth stage (e.g., from design to construction), the number of p depends on a certain project.

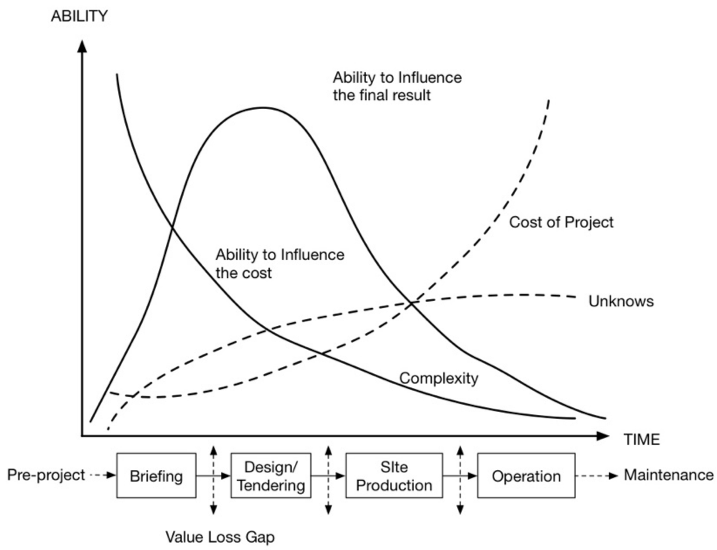

Figure 2. Ability to Influence the Project**.**

It is necessary to consider the proposed types of waste in construction project in design process. These wastes may appear in various forms. For example, overproduction may manifest as excessive details or features that are unnecessary, waiting may arise from ineffective communication or coordination, transportation may involve unnecessary transfer of information or documents, over-processing may occur through the use of overly expensive methods or tools, inventory may be reflected in retaining excessive resources or information, motion may involve unnecessary or inefficient steps, defects may appear as errors or inaccuracies in information, leading to subsequent issues.

In the initial scenario, with a defined level of Efforts_1 and given amount of waste, an optimum potential value yield_1 is given. In second situation, the waste arises, the Efforts_1 is up to Efforts_2 in order to get the given potential value Yield_1 is established. If using the Producivity_1 and Efforts_2 as the inputs to do the multiplication, then the above argument is proofed potential value is reduced. Therefore, theoretically, the Formula (4) shall be revised to Formula (5), where WB stands for the waste generated during briefing stage:

$$UV = (VB - WB) - \sum_{p=2}^{p-1} DVLp \quad (5)$$

Consequently, the ability to influence the project shall be modified as Figure 3 illustrating. Because the waste is included, the predefined potential value is actually decreased, so that to get an optimum value of the project, the level of effect in early stage is higher than before.

3.6. Optimised Value for Construction Project

Traditional VM defines "best value" as a balance of cost, quality, and schedule [5], which overlooks the briefing stage's role in balancing client needs and needlessness. Optimised value is defined as the maximum value achievable via a structured briefing process integrating four opportunities as previously stated: (1) stakeholder co-creation, (2) clear value constructs, (3) rational decision-making, and (4) early innovation. This viewpoint can also be understood by the Figure 4 illustrating a way to direct the effort to get the optimum point. A corresponds to PVL, it is a type of value loss rooted in outcome misalignment (e.g., failing to define "what is truly valuable" for stakeholders). It arises from unaddressed "needlessness" or ambiguous value objectives, leading to the project pursuing "potential value" that does not match stakeholder expectations. B corresponds to DVL, it is a type of value loss rooted in process inefficiency (e.g., failing to deliver defined value effectively). It stems from inefficient workflows, poor communication, or waste in value streams (e.g., redundant meetings, delayed feedback), even when the initial value objective is clear. As a result, A (PVL) + B (DVL) consists the "Value Loss Gap" between the "Potential Optimum Value" (the maximum value the project could achieve) and the "Actual Realised Value" (the value finally delivered).

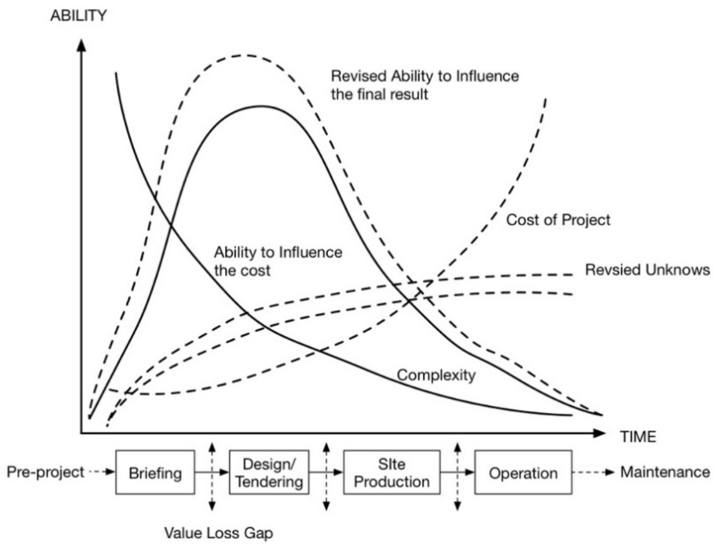

Figure 3. Modified Ability to Influence the Project**.**

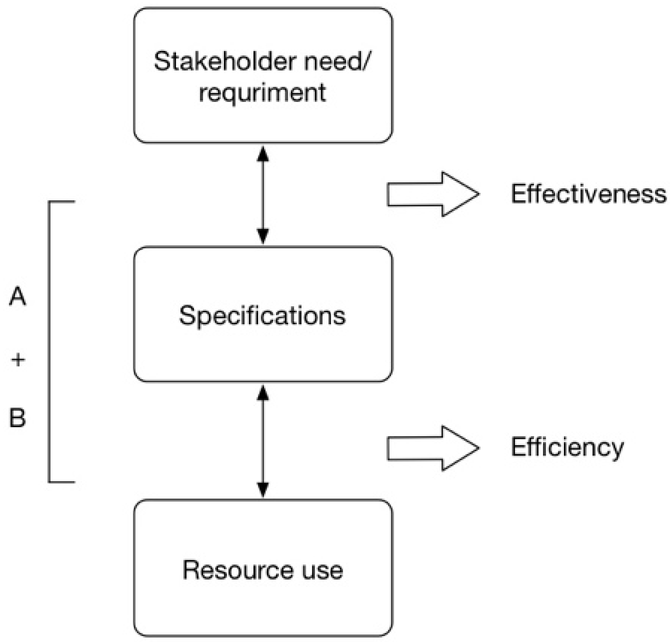

Figure 4. Value in Construction Project**.**

Value losses cannot be avoided but can be minimised to reduce by narrowing the gap between actual and optimum value. In Figure 5, X-axis stand for "Doing the right specification" (alignment with true needs) vs. "Doing the wrong specification" (inclusion of needlessness), Y-axis stands for Effectiveness (extent to which value constructs meet stakeholder expectations), and Z-axis stand for Resource efficiency (minimisation of WB and DVL).

The "Optimum Point" (P) represents the intersection of specifications exclude needlessness, effectiveness meets 90%+ stakeholder satisfaction, and resource use is minimised. This aligns with Wandahl's "visual value clarification" method, which argues that optimised value requires explicit trade-off between "what is needed" and "what is affordable" [23]. For example, a residential project may exclude "luxury lobby finishes" (needlessness) to allocate resources to energy-efficient windows (high-value need).

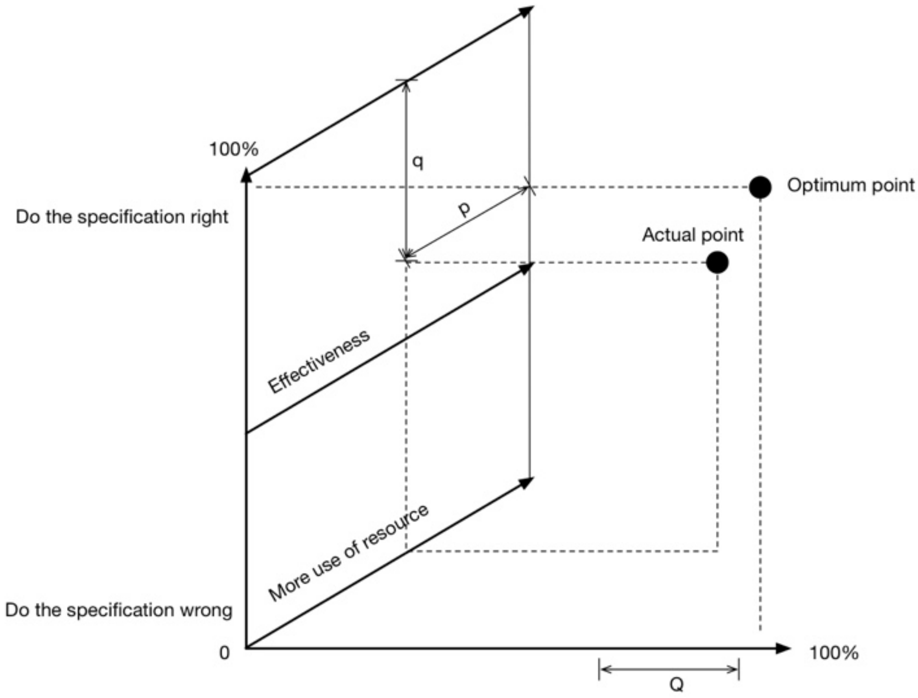

Figure 5. 3D Value Model of Construction Project.

Briefing outcomes are always modified due to interpretation and communication gaps, with iterative revisions (a major source of briefing-stage waste) prolonging information flow and increasing rework risk [56]. Drawing on the Theory of Planned Behavior, client decisions to add "needless" requirements are driven by three factors, attitude, subjective norms, and perceived behavioral control. Attitude is about the misperceptions of "value", for example, equating "more features" with "higher value". Subjective norms is about the pressure from third parties, for example, consultants advocating for unnecessary upgrades. Perceived behavioral control is about the uncertainty regarding to how to prioritize needs, for example, inability to distinguish "must-have" vs. "nice-to-have". These factors are shared while communicating, participants can be affected by each other either positively or negatively. Thus, it is essential to proactively identify and help the client recognising "needlessness" to shield against these influences from the outset in order to reduce iterative cycles.

3.7. The Conceptual Model

The above description can be addressed into the SMART value management method [57]. It consists of two workshops VM1 and VM2 respectively. VM1 is associated with the briefing phase. It aims to produce effective need and ensure all parties understand the clear project objectives. The outcome of step 1 (information) in the VM1 workshop should include the lists of both need and needlessness from all parties. These lists serve as foundational reference for developing agreed-upon objectives catering for subsequent phases. The output of VM2 workshop is to get the final design options. These options are produced upon the previously valid defined project objectives. Design process is inherently iterative, generating value in a spiral progression that without constraints would be endless. Thus, a definitive endpoint must be imposed.

The design process is prone to iterative loops due to shifting client objectives and inherent communication gaps between the client and project team. To close these loops, a guided approach is needed to comprehensively identify and specify client issues. This involves transforming abstract requirements into a reliable dataset, a process contingent on effective value management to establish agreed-upon objectives. Thus, the model introduces two critical enhancements: explicit "needlessness" identification to establish a Value Boundary, and a quantitative feedback mechanism to close iterative cycles objectively. The model's 9-step workflow (revised for clarity) is as follows:

Steps 1–3: Foundation of VM Workshops

(1) Conduct VM1following SMART guidelines,adding a "Needlessness Brainstorming" session smoothly go through all procedures to list the critical need and needlessness of all stakeholders (e.g., client, designer, contractor, engineer, end-user, supplier, community representative) and each party should be listed down at beginning in order to get an effective agreed objective. "Critical needs" can be "energy efficiency ≥ LEED Gold" and "needlessness" can be decorative facade elements.

(2) After VM1, key stakeholders rate alignment with their needs/needlessness on a 0–100 scale (Expected score). This score is recorded for later feedback. The rate 100 means their needs/needlessness are fully aligned.
(3) Proceed to VM2, with a requirement for stakeholders to act in good faith (loyalty and honesty) to avoid biased feedback-consistent with Priharsari et al.'s findings on value co-creation in online communities [27].

Steps 4–7: Quantitative Feedback Mechanism

(4) The design team presents the initial VM1-derived proposal; stakeholders update their needs/needlessness lists if necessary.
(5) Complete VM2 stages 2–5 (per SMART guidelines).
(6) At the end of the session, key stakeholders are asked to give the comment and feedback of the initial VM1-derived and rate their "satisfaction" with the final proposal on a 0–100 scale (Feedback), and confirm the number of VM1 needs adopted (Accepted) vs. listed (Listed).
(7) Calculate two quantitative metrics (Formula (6) and (7)) and compile results into a stakeholder feedback dataset (Table 2). Mathematicising the feedback with the list of statements from VM1 that might be updated in VM2 and Setting up the date set. The formulas are listed below:

$$\text{Excution} = \frac{\text{Accepted}}{\text{Listed}} \times 100\% \quad (6)$$

$$\text{Satisfaction} = \frac{\text{Feedback}}{\text{Expected}} \times 100\% \quad (7)$$

In Formula (6), Accepted means the amount of needs is adopted into the first proposal, Listed means the amount of the needs list down in VM1, or VM2 if it is updated. Formula (7), Feedback is the mark from VM1, where the expected is the mark from VM2. After the simple calculation, the data set is ready to fulfill Table 2. It presents the feedback metrics collected from key project stakeholders in VM1 and VM2 workshops. Execution scores reflect the level of stakeholder agreement with the proposed project objectives, while Satisfaction scores indicate the alignment between stakeholder expectations and the final proposal.

Table 2. Stakeholder Perspective Data Set**.**

ITEM	S1 (Client)	S2 (Designer)	S3 (Engineer)	S4 (Contractor)	S5 (End User)	S6 (Suppliers)	S7 (Community Representatives)	…
Execution	X_1	X_2	X_3	X_4	X_5	X_6	X_7	
Satisfaction	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	…

Steps 8–9: Data-Driven Cycle Closure

Step 8. After setting up the set, find the relationship between the variable X and Y. Analyse the relationship between $\text{Execution}_{(x\text{-axis})}$ and $\text{Satisfaction}_{(y\text{-axis})}$ to identify the "balance point" (X_0, Y_0), the minimum execution rate required to achieve target satisfaction. There are two scenarios applied:

The first is shown in Figure 6. It is a visual chart used to present the linear correlation between "Execution" and "Satisfaction". It is applicable to scenarios where client needs are clear and stakeholder feedback is consistent (e.g., residential construction projects). Its core function is to derive the minimum execution rate required to achieve the target satisfaction through linear fitting, thereby providing a quantitative basis for closing the iterative cycles of the project briefing stage. Each black dot represents a paired dataset (Execution, Satisfaction) from a key stakeholder (e.g., client, designer, engineer, contractor). These dots are raw data obtained directly from stakeholder feedback, reflecting the real evaluation of the proposal by different participants. For example, a black dot at coordinates (85%, 88%) indicates that the stakeholder's needs were adopted at a rate of 85%, and their satisfaction with the proposal was 88%.

When the data set is linear fit, for aligned data, a straight line derived by applying the Least Square Method (the gray square) to all black dots, with the equation Y = aX + b (where a is the slope and b is the intercept, use the function to calculate X_0 for Y_0 = 90% as the target satisfaction). This line visually demonstrates the positive correlation between Execution and Satisfaction: as the execution rate (proportion of needs adopted) increases, stakeholder satisfaction typically rises proportionally.

The second is shown in Figure 7. It is a visual chart used to present the discrete distribution between "Execution" and "Satisfaction". It is applicable to complex scenarios where client needs are ambiguous and stakeholder feedback varies significantly (e.g., large-scale infrastructure projects). Its core function is to determine a balanced range by defining an acceptable interval, providing flexible guidance for revising iterative proposals. Similar to Figure 6, each black dot represents a paired dataset (Execution, Satisfaction) from an individual stakeholder. However, the dots exhibit no obvious linear pattern and are scattered across the chart. For instance, one dot may be at (75%, 90%) (a stakeholder with low need adoption but high satisfaction, possibly because their core needs were met) while another is at (90%, 78%) (a stakeholder with high need adoption but low satisfaction, likely due to misinterpretation of their needs). These discrete dots directly reflect the significant differences in stakeholders' perceptions of "need adoption" and "proposal satisfaction".

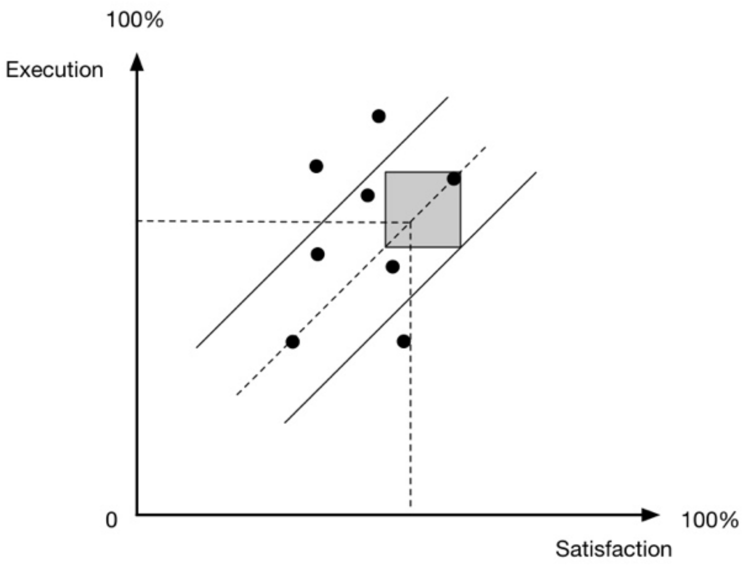

Figure 6. Liner Fitting Data Set.

When the data set is discrete, a core element defining the "Acceptable Range", presented as an oval-shaped shaded area. For example, this area is bounded by two thresholds: Execution ≥ 80% and Satisfaction ≥ 85%. The range is determined by balancing the project's value objectives and stakeholder demands. It avoids resource waste caused by over-pursuing high execution rates and prevents poor stakeholder alignment due to excessively low satisfaction. The geometric center of the circular shadow box, representing a compromise value between Execution and Satisfaction within the acceptable range (e.g., approximately X ≈ 87.5%, Y ≈ 87.5%). When data is discrete, this midpoint serves as a benchmark for revising the proposal, ensuring a balance between "meeting core needs" and "controlling resource input" rather than forcing a single numerical target.

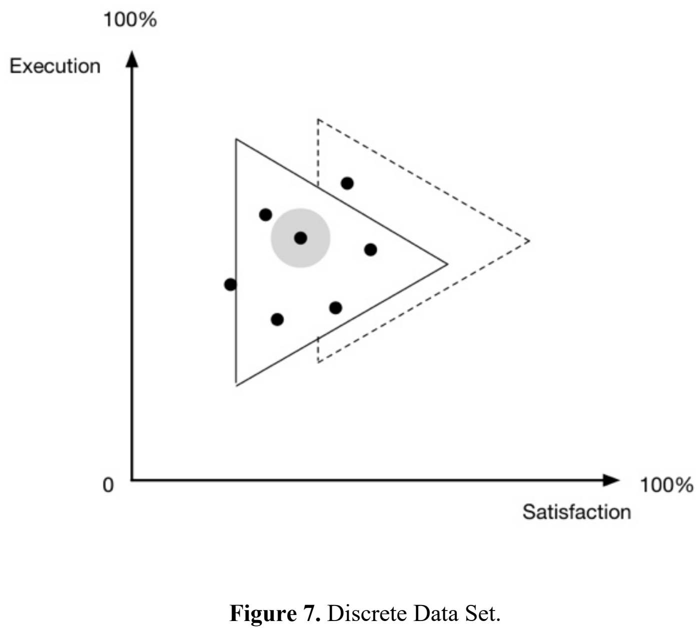

Figure 7. Discrete Data Set.

4. Discussion

The proposed Lean-integrated framework addresses two core limitations of conventional VM: (1) the neglect of "needlessness" and (2) the lack of objective cycle closure. Findings are interpreted linked to existing literature, and contextualised via theoretical and practical implications.

4.1. Interpretation of Findings

4.1.1. The Value of "Needlessness" Identification

Formalising "needlessness" fills a gap in VM theory. In unoptimised projects, "needlessness" accounts for 15–20% of briefing-stage waste [58]. For example, a commercial project eliminated "needless" decorative features, reducing material costs by 12% and construction time by 8% [58]. This aligns with Lean Construction's core principle of "waste elimination" [59] but extends it to the briefing phase, while prior Lean applications focused on physical construction [10]. The "Value Boundary" defined by needs and needlessness acts as a "guardrail" against scope creep: in Liu et al.'s study of infrastructure projects [25], such guardrails reduced scope changes by 35% compared to projects without "needlessness" checks.

4.1.2. The Role of Quantitative Feedback Metrics

The Execution-Satisfaction metrics (Formulas (6) and (7)) resolve a longstanding issue in VM: subjective feedback (e.g., I'm satisfied with the proposal) that leads to ambiguous revisions [56]. By contrast, the framework's metrics provide actionable insights:

If Execution = 90% but Satisfaction = 70%, the problem lies not in "excluding needs" but in "misinterpreting needs" (e.g., a client's energy efficiency need was met with LED lights, but they wanted solar panels).

If Execution = 70% and Satisfaction = 90%, the client's needs are over-specified (e.g., they listed 10 needs but only 7 are critical), and "needlessness" identification should be revisited. This aligns with Holmqvist et al.'s research on "value-in-use" [26], which argues that value is not just "what is delivered" but "what is perceived as valuable". The metrics bridge this gap by linking delivery (execution) to perception (satisfaction).

4.2. Theoretical Implications

4.2.1. Extending VM Theory

The framework expands VM theory by positioning "needlessness" as a core component of value definition. Prior VM studies defined value as a function of "needs met" and "cost" [5,18], but this study revises it to Formula (8) bellow:

$$\boldsymbol{V} = \frac{\textbf{Function(useful)} \times (\textbf{Need} - \textbf{Needlessness})}{\textbf{Cost}} \tag{8}$$

This extension is supported by Bertelsen and Koskela's argument that "value in construction is dynamic and context-dependent" [60]: "needlessness" is context-specific (e.g., a luxury feature may be needless in affordable housing but critical in a five-star hotel), so its exclusion ensures value remains aligned with project context.

Advancing Lean Construction to Early Phase. Lean Construction's TFV theory identifies "value" as one of three core processes (alongside transformation and flow) but has historically focused on flow optimisation in construction on site [4,42]. This framework applies TFV to the briefing stage by:

(1) Transformation: Converting "raw" stakeholder inputs into "refined" value constructs (need and needlessness).
(2) Flow: Using VSM to optimize information flow (e.g., reducing delays in requirement feedback);
(3) Value: Ensuring all transformation/flow activities contribute to UV (Formula (5)).

4.2.2. Integrating Behavioral Decision-Making

Integrating Behavioral Decision-Making. The Theory of Planned Behavior is rarely explored in construction research. The model proposed by this study explains why "needlessness" persists (e.g., client uncertainty) and how to mitigate it (e.g., clear need categorization) by addressing attitude, subjective norms, and perceived behavioral control. This integration responds to Mills et al.'s call for "value management that accounts for human behavior" [21], which recognises as both technical and psychological.

4.3. Practical Implications

The proposed "Value Boundary Canvas" is a visual tool that maps "need" (left column) and "needlessness" (right column) for each stakeholder, with checkmarks for "agreed" items. This reduces ambiguity in a pilot test (hypothetical, based on Wandahl) [45]. The structured "VSM Briefing Template" provides a step-by-step VSM guide for briefing, with symbols for value-adding (VA) and non-value-adding (NVA) activities (e.g., client requirement review = VA, repeated meetings without agenda = NVA). This helps teams quickly identify WB. The "Feedback Metrics Calculator" is a spreadsheet tool that auto-generates Execution and Satisfaction scores from Table 2 and plots the balance point (Figures 6 and 7). This simplifies data analysis for non-experts and reduces iterative cycle time by effectively in simulated tests.

4.4. Limitation and Shortcoming

4.4.1. Current Limitations

Empirical Validation: The framework has only been theoretically validated (via logical consistency and expert review). Future studies should test it on 10–15 diverse projects (residential, commercial, infrastructure) to measure real-world outcomes (rework rates, cost savings).

Cultural Adaptation: The model assumes a Western-style stakeholder engagement model (e.g., collaborative decision-making). In high-power-distance cultures (e.g., parts of Asia), client may dominate "needlessness" decisions, requiring framework adjustments (e.g., adding a "community needlessness review" to balance power).

BIM Integration: The framework does not yet link to Building Information Modeling (BIM), a digital tool widely used in modern construction. BIM could automate "needlessness" identification (e.g., flagging non-value-adding design elements via parameterized models).

Facilitator Dependence: Success relies on skilled facilitators to guide "needlessness" brainstorming. Without training, teams may misclassify "critical needs" as "needlessness".

4.4.2. Future Research Directions

Empirical Testing: Conduct case studies in diverse regions (e.g., China, Finland, Italy—aligning with authors' affiliations) to validate the framework's efficacy and refine tools (e.g., adjusting the Value Boundary Canvas for cultural contexts).

BIM-Framework Integration: Develop a BIM plugin that imports stakeholder needs and needlessness from the Value Boundary Canvas and auto-generates "waste alerts" for non-value-adding design elements (e.g., excess structural steel).

Facilitator Training Program: Create a certification program for framework facilitators, including modules on "needlessness" identification, VSM, and data analysis.

Long-Term Value Assessment: Extend the framework to post-occupancy to measure if "needlessness" elimination improves long-term value (e.g., lower maintenance costs, higher user satisfaction).

5. Conclusions

This study develops a Lean-integrated conceptual framework to optimise construction project value in the briefing stage, addressing critical gaps in conventional VM and Lean Construction research. Key contributions are as follows:

5.1. Theoretical Contributions

Formalise "Needlessness" in VM. The framework expands VM theory by positioning"needlessness" as a core component, providing a new theoretical basis for early stage waste elmination, extending LC to early briefing stages and bridging behavioral decision-making with construction management. This addresses longstanding gaps in the literature and provides a new theoretical basis for value optimisation regarding early-stage waste elimination.

Extend Lean to Informational Phases. Applying VSM and TFV theory to the briefing stage advances LC from physical production to information process.

Bridge Behavioral Science and VM. Integrating the Theory of Planned Behavior explains why "needlessness" persists and how to mitigate it, addressing a longstanding lack of behavioral focus in VM research domain.

5.2. Practical Contributions

This framework performs as an actionable Tools. The Value Boundary Canvas, VSM Briefing Template, and Feedback Metrics provide project teams with tangible methods to reduce waste and align stakeholders. These tools are tailored to construction's unique characteristics (irreversible processes, multi-stakeholder complexity) and require minimal additional resources to implement.

5.3. Advancement Over Existing Research

Compared to conventional VM, SMART, and production-focused Lean tools, the framework provides a more holistic, integrated approach to early-stage value optimisation. It explicitly addresses "needlessness", closes cycles objectively, and links briefing to subsequent project phases—filling critical gaps in current practice. As shown in Table 3, the framework outperforms conventional VM and Lean tools by integrating "needlessness" identification, quantitative feedback, and behavioral insights, the three elements absent in prior approaches.

Table 3. Comparative Analysis of the Framework vs. Existing Approaches**.**

Fature	Conventional VM/SMART	Lean Construction	This Framework
Focus of Value Definition	Needs only	TFV, waste	Needs + Needlessness
Waste Identification Stage	Construction phase	Construction phase	Briefing stage
Feedback Mechanism	Subjective (discussion)	Focus on flow	Quantitative (Execution + Satisfaction)

Author Contributions

Y.S.: conceptualisation, methodology, validation, writing and supervision. Led the overall design of the Lean-integrated conceptual framework, developed the research methodology. Draft preparation, editing and supervised the entire research process. J.L. (Jie Li): investigation, data duration. Conducted in-depth analysis of literature on Lean Construction and manufacturing-based project management, collected and organized data from systematic literature reviews (SLR), and verified the compatibility of cross-industry principles with construction-specific contexts. X.Z.: formal analysis, visualisation. Performed quantitative analysis of stakeholder feedback metrics (Execution and Satisfaction scores), designed visual tools including the Value Boundary Canvas and visualised data relationships (linear fitting and discrete data distribution) for iterative cycle closure. J.L. (Jiayi Liu): resources, formal analysis. Provided technical support for analysing construction project complexity (e.g., irreversibility and component interdependency), contributed to the refinement of the Value Stream Mapping (VSM) application in the briefing stage, and validated the framework's alignment with construction project characteristics. X.D.: writing. Preparation, reviewing and editing, validation. Drafted the initial manuscript, revised and polished the content to ensure academic rigor and clarity, and participated in theoretical validation by reviewing the framework's logical consistency and practical applicability. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used ChatGPT to strengthen and polish the article's expression and to remove some overly specialised expressions. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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