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# A FRAMEWORK FOR INTEGRATING 3P WITHIN TVD

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## ABSTRACT

Maximizing value generation is a core principle in Lean Construction and Target Value Delivery (TVD). This paper investigates how participatory design processes involving a wide array of end-users throughout the lifecycle of a project can enhance value management in the delivery of built assets. The study addresses the challenges of aligning user-defined value in complex projects, where rigid technical programs often marginalize evolving stakeholder needs.

Adopting a constructive research methodology, this study integrates 3P principles into a TVD framework to optimize value delivery. Tools such as proximity matrices, functional evaluation grids, and trajectory mapping are used to identify and prioritize user needs. Two case studies, including an IT engineering department within a university and a high school project, demonstrate how these tools facilitate iterative, user-centered design processes while addressing gaps in existing value management methodologies.

The findings contribute a novel framework for embedding dynamic and inclusive value management practices into TVD. By balancing functional, experiential, and societal dimensions of value, the proposed approach fosters innovation, improves stakeholder satisfaction, and enhances alignment between academic workflows and spatial configurations.

## KEYWORDS

Project Definition Participatory Design, 3P, and TVD.

## INTRODUCTION

Learning institutions, including schools and universities, increasingly face the challenge of adapting their infrastructure to rapid technological advances and evolving pedagogical methods. The traditional rigidity of project delivery methods often fails to account for the dynamic and diverse needs of academic institutions, particularly in spaces designed for teaching, research, and collaboration (Womack & Jones, 1996). In this context, the active involvement of professors, teachers, staff and students in the design process presents an opportunity to redefine value and optimize project outcomes. However, conventional approaches frequently freeze stakeholder inputs into static requirements, leading to misalignment between design solutions and end-user needs (Salvatierra-Garrido et al., 2010).

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Target Value Delivery (TVD) has emerged as a Lean project delivery method that prioritizes collaboration and stakeholder-defined value. TVD seeks to align project outcomes with user needs while adhering to budget and schedule constraints. Yet, the traditional emphasis on cost reduction within TVD often undermines broader dimensions of value, such as adaptability, innovation, and user experience (Tillmann & Eckblad, 2023). This study explores how integrating 3P principles into TVD can enhance value management in academic infrastructure projects.

The research investigates participatory and iterative methods, including tools such as proximity matrices and trajectory mapping, to bridge the gap between static technical requirements and evolving stakeholder-defined value. The proposed framework offers actionable strategies for embedding inclusive and adaptive value management practices into TVD, contributing to more effective and innovative academic spaces (Forgues & Brunet, 2018).

# BACKGROUND

## DEFINING VALUE IN LEAN CONSTRUCTION AND TVD

Value is a central tenet of Lean Construction and TVD, yet its interpretation is complex and multifaceted. Ballard (2012) describes value as the fulfilment of what the client is willing to pay for, emphasizing cost efficiency and alignment with stakeholder expectations. However, this perspective often reduces value to an economic consideration, overlooking other dimensions such as societal impact and user experience.

Salvatierra-Garrido et al. (2010) emphasize that value is inherently intersubjective, governed by cultural, social, and organizational contexts. In their critical review, they argue that value delivery must account for these dimensions, particularly in public projects where outcomes impact a wide range of stakeholders. For instance, in academic environments, value extends beyond cost efficiency to encompass the creation of spaces that foster innovation, collaboration, and adaptability to evolving research needs.

Womack and Jones (1996) introduce the idea that value can only be defined by the end-user. This aligns with the principles of TVD, where stakeholder collaboration is essential to articulate project goals and ensure alignment with user requirements. Yet, challenges arise when user needs are not fully understood or when traditional project delivery frameworks prioritize technical requirements over user satisfaction (Ballard, 2012).

In institutional projects, value often manifests as a combination of functional, experiential, and societal dimensions. For universities, this includes considerations like student and faculty satisfaction, flexibility for research evolution, and alignment with institutional missions. These dimensions highlight the complexity of defining and managing value in TVD frameworks (Forgues and Brunet, 2018).

## PROPOSITIONS FOR MANAGING VALUE IN TVD

While there is little research regarding how the Value dimension could be better addressed in TVD, the Value Analysis Model, the Value Attribute List and Human-Centered Design offer potential improvements to value management in TVD.

### The Value Analysis Model (VAM)

The Value Analysis Model (VAM) systematically captures stakeholder requirements and translates them into measurable indices: the Desired Value Index (DVI) and the Potential Value Index (PVI). This tool allows teams to evaluate the alignment of project decisions with stakeholder priorities by providing quantifiable metrics. As described by Giménez et al. (2022), VAM is particularly useful in assessing cost-efficiency and technical compliance within the TVD framework.

However, VAM faces several limitations. Its reliance on static metrics makes it inflexible for projects where stakeholder needs evolve over time, such as institutional infrastructure projects where priorities and workflows often shift. Moreover, the model depends heavily on the interpretation of design teams, which introduces the risk of bias and misrepresentation. This reliance on professional interpretation can marginalize user input, undermining the broader dimensions of value such as user satisfaction and adaptability (Tillmann & Eckblad, 2023) .

Additionally, VAM's focus on measurable indices often oversimplifies complex user requirements. While it offers a structured approach to evaluating value, it prioritizes technical and economic aspects over experiential and societal dimensions, which are critical in academic contexts. This limitation restricts its utility in projects where user experience and collaboration are central to success. In academic contexts, where the user experience of students and faculty plays a critical role, this oversight can undermine the broader goals of the project.

### The Value Attribute List (VAL)

The Value Attribute List (VAL) builds upon the VAM by categorizing value attributes into multiple dimensions, encompassing both process and product value propositions. Khalife et al. (2022) propose a structured grid of 16 categories to capture and prioritize stakeholder satisfaction criteria, thereby broadening the scope of value considerations. VAL allows teams to identify and align project goals with diverse stakeholder needs in a systematic manner.

Despite its expanded scope, VAL shares several limitations with VAM. It focuses primarily on technical attributes and tangible outcomes, such as functionality and cost efficiency, often neglecting qualitative and subjective dimensions like user satisfaction and adaptability. Furthermore, VAL relies on top-down interpretations of stakeholder input, which can marginalize end-users by reducing their direct influence on design decisions.

In academic projects, this reliance on design professionals to interpret stakeholder requirements can create a disconnect between user needs and project outcomes. While VAL provides a framework for value assessment, it lacks mechanisms for integrating dynamic user feedback, limiting its effectiveness in participatory and iterative design processes.

### Human-Centered Design (HCD)

Human-Centered Design (HCD) focuses on understanding and addressing the needs, perspectives, and experiences of end-users through iterative, empathy-driven design processes. HCD is particularly relevant in academic settings, where diverse user groups, such as professors and students, have varying requirements and workflows. By engaging stakeholders directly, HCD fosters collaboration and ensures that project outcomes align with user-defined value (Tillmann & Eckblad, 2023).

HCD emphasizes the importance of empathy in value management, employing tools like interviews, workshops, and prototypes to identify pain points and test potential solutions. This iterative approach allows stakeholders to evaluate and refine designs in real-time, ensuring that project goals remain responsive to evolving user needs. For example, in academic projects, HCD can help visualize how spatial configurations support collaborative teaching or research activities (Tillmann & Eckblad, 2023).

However, HCD also has limitations. While it excels at capturing qualitative insights, it often lacks the quantitative rigor required to align user needs with measurable project goals. This creates challenges in integrating HCD with tools like VAM and VAL, which rely on structured metrics for value assessment. Additionally, HCD may not adequately address the impact of space configuration on broader organizational functions without supplementary tools like in Lean Design or 3P methodologies. These gaps underscore the need for hybrid approaches that combine HCD's qualitative strengths with the structured frameworks of existing value management tools.

### 3P approach to TVD

While VAM, VAL, and HCD each offer valuable contributions to value management, their limitations highlight the need for more adaptive and inclusive approaches. VAM and VAL rely on static metrics and professional interpretations, which restrict their ability to respond to dynamic user needs. HCD, while effective in capturing qualitative insights, lacks the structured rigor to align its findings with measurable project outcomes.

Furthermore, HCD's focus on user experience may overlook the broader organizational implications of design decisions, such as workflow efficiency and long-term adaptability. This limitation is particularly critical in academic projects, where spatial configurations must support both immediate and future research and teaching needs. Addressing these gaps may require a hybrid approach that integrates HCD's qualitative strengths with the quantitative frameworks of VAM and VAL, supplemented by participatory tools like trajectory mapping and proximity matrices

The integration of 3P (Product Preparation Process) into the TVD framework has shown promise in addressing these gaps. 3P incorporates participatory workshops and simulations, enabling stakeholders to visualize and refine design solutions collaboratively. 3P employs cross-functional teams, allows the rapid testing of ideas and embeds lean concepts into the production process (Ramakrishnan and Testani, 2011). In the built asset industry, tools like functional connections matrices further enhance this process by providing traceability and validation mechanisms that keep user requirements central throughout the project lifecycle. Unlike VAM and VAL, these tools are dynamic and user-driven, allowing stakeholders to adapt project requirements in response to changing needs. By providing a platform for real-time feedback and traceability, they empower users to maintain control over design decisions and ensure alignment with their priorities.

In academic projects, these innovations hold particular promise. They enable institutions to balance competing dimensions of value—such as cost efficiency, flexibility, and user satisfaction—while fostering a collaborative and participatory environment. Future research should focus on refining these tools and integrating them into broader TVD frameworks to enhance their effectiveness.

## METHODOLOGY

This study adopts a constructive research methodology, a problem-solving approach that integrates theoretical insights with practical applications (Lukka, 2003). The methodology bridges gaps in value management for TVD by developing a participatory and iterative framework that aligns with academic project environments.

## RESEARCH DESIGN

The methodology is designed to address the challenges of capturing and managing dynamic, user-defined value in academic settings. This framework incorporates 3P principles into the TVD process to facilitate iterative feedback and enhance collaboration among professors, students, and administrators. The framework emphasizes participatory tools, such as proximity matrices, functional evaluation grids, and trajectory mapping, which are tested through two case studies under similar regulatory and institutional contexts.

Case studies were selected to analyze the application of proposed participatory tools within the TVD framework. Each case illustrates how the proposed methodology improves alignment between project outcomes and stakeholder needs while addressing gaps in existing tools like the VAM and VAL.

## Data Collection investigation phase

The data collection process was informed by the constructive research methodology and focused on two academic infrastructure projects. These cases illustrate how the proposed framework facilitates participatory design and dynamic value alignment within a TVD framework (Figure 1). The cases were selected for their relevance to collaborative academic environments and their alignment with Lean principles. To evaluate the effectiveness of the proposed framework, two case studies were conducted in educational institutions under similar municipal and regulatory conditions. These cases illustrate the application of 3P methodologies within a TVD framework, with varying degrees of integration.

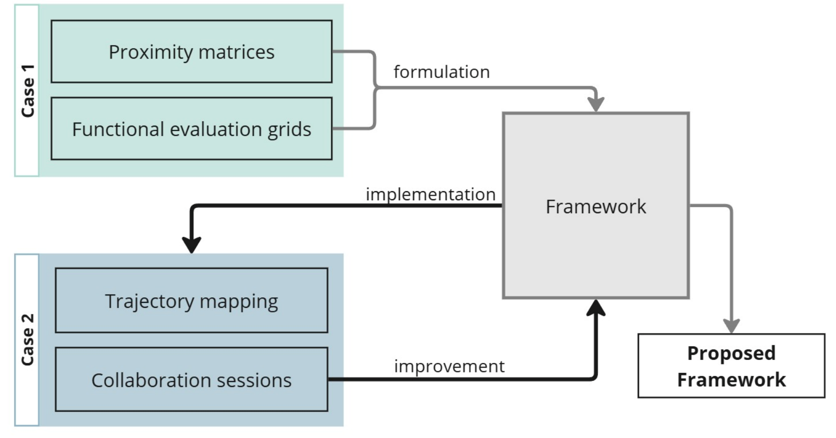


Figure 1: Development and testing of the proposed framework

The first case, a High School Design and Expansion, involved the expansion of a high school to accommodate new pedagogical approaches focused on collaborative learning spaces. The project emphasized participatory workshops with faculty, administrative staff, and students to identify and prioritize user needs. The use of proximity matrices and functional evaluation grids enabled the design team to optimize spatial layouts for flexible classroom configurations, improving alignment with the school's educational goals.

The second case, University IT Department Development, focused on the development of a research and teaching facility for a university department of information technology. This project required balancing the functional needs of researchers and educators with the evolving requirements of students. Trajectory mapping exercises and collaboration sessions were employed to address workflow inefficiencies and optimize the integration of research and teaching labs.

Both cases highlighted the challenges of managing dynamic user requirements in academic settings. The iterative tools and methodologies tested in these projects informed the refinement of the proposed framework and validated its applicability across different contexts. The data collection methods (Table 1) included workshop observations, interviews with stakeholders, and analysis of project documentation (e.g., design propositions, functional link matrices). These activities were informed by the principles outlined in the literature review, particularly the emphasis on participatory methods and iterative validation.

Table 1: Data Collection Methods

| Data collection | Case 1 | Case 2 |
|---|---|---|
| Workshop observations | 8 workshops | 9 workshops |
| Documents analyzed | Design propositions, meeting reports, matrix of functional links, project description documents, government requirements documents, etc.. | Design propositions, meeting reports, design assessment grid, project description documents, interview transcripts, etc |
| Conducted interviews | 6 semi-structured interviews with different stakeholders | 9 semi-structured interviews with different stakeholders |

**Data Collection, intervention phase**

Data was primarily collected on case 02 to formulate the framework. To do so, a survey was used to capture professors and students' expectations regarding what could be their preferred work and research environment. Research clusters were proposed and discussed in Kaizen workshops. A research cluster is a collaborative, multidisciplinary structure designed to foster interaction, synergy and the exchange of ideas between researchers. It provides a physical and intellectual environment conducive to scientific innovation, where researchers can work closely together, sharing knowledge, resources and complementary skills. It offers a shared space comprising laboratories, offices, meeting rooms, meeting spaces, technical facilities, specialized equipment and living areas to create small communities. These can be used effectively and efficiently by all researchers in a dynamic context. It also encourages informal exchanges and social interaction between researchers, promoting the cross-fertilization of ideas, the resolution of complex problems and the emergence of new research projects and increased scientific productivity.

This concept was tested for a period of six months in a space as a prototype involving eight teachers and their students. Weekly meetings were held to identify the plus delta and improve the space to accommodate their research activity. 12 interviews (4 professors and 8 students) were conducted at the beginning and the end of the prototyping first measure the gaps between their expectations and perception of the final results, second to capture the improvements that will be required for the project. The facility in which the University IT department will be located received approval to launch a TVD procurement process for design and construction. From the lessons learned in the two cases, this framework was devised to include 3 P in the TVD process.

# RESULTS

## PROPOSED FRAMEWORK

The proposed framework (Figure 2) incorporates 3P tools into the TVD framework to optimize value generation. By embedding participatory tools and iterative processes, this framework ensures that user-defined value remains central to decision-making while addressing the dynamic requirements of academic institutions. It is structured into the planned four phases.

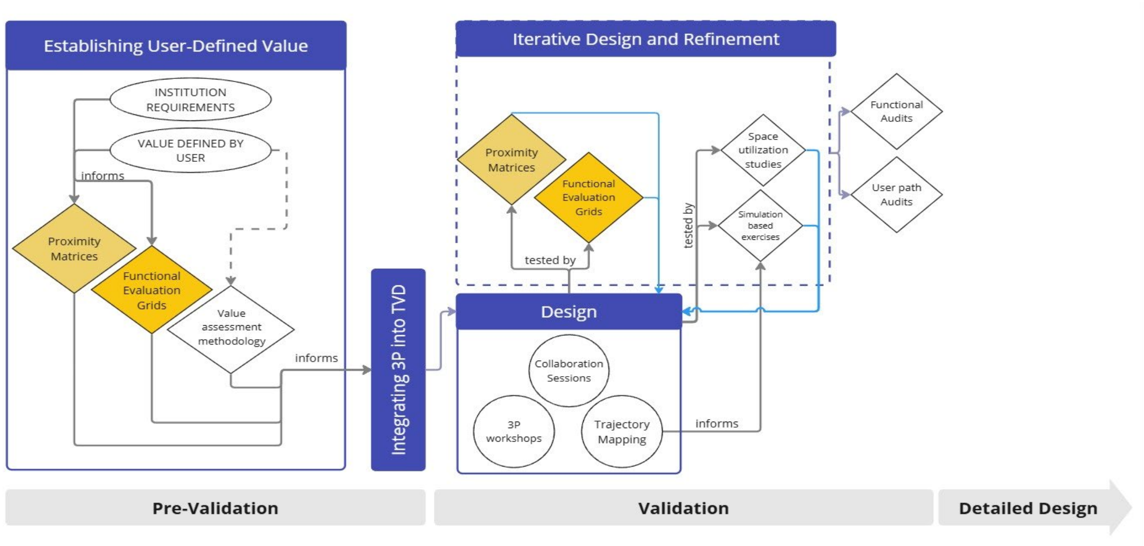


Figure 2: Inclusion of the Framework within TVD validation Phase

## Phase 1: Establishing User-Defined Value

This phase is critical for defining value priorities and setting the foundation for participatory design. This phase emphasizes the early engagement of stakeholders—professors, students, and administrators—to articulate their needs and expectations. Two core tools, proximity matrices and functional evaluation grids, play a central role.

Proximity matrices map functional blocks, such as teaching labs, research clusters, and support spaces, and assess their spatial relationships. Unlike traditional diagrams, these matrices integrate both vertical and horizontal adjacency considerations to align spatial configurations with academic workflows. For example, in the university IT department case, proximity matrices revealed inefficiencies in the placement of teaching labs, prompting a reconfiguration that improved student access and collaboration.

Functional evaluation grids provide a structured means of assessing how well design proposals align with user-defined criteria. Stakeholders collaboratively define key attributes—such as flexibility, accessibility, and technical support—which are then weighted and scored against design options. This tool helps prioritize critical needs while ensuring transparency in the decision-making process.

Once the grid has been defined, it will be necessary to clarify the value assessment methodology at certain key project milestones (e.g. choice of preferred solution, financial optimization, etc.), so as never to compromise the key functionalities of the targeted new operating mode. A draft methodology can be formalized and integrated into the signatory selection process, and subsequently endorsed by the TVD team as part of the target costing and justification process. In addition to these tools, the Pre-Validation phase incorporates structured workshops to identify misalignments between proposed designs and stakeholder goals. Iterative reviews ensure that unresolved conflicts are addressed before advancing to the next phase.

## Phase 2: Integrating 3P into TVD

This phase introduces 3P principles into the TVD process to ensure that user needs are accurately translated into actionable design strategies. Key activities of onboarding of the Team include:

- 3P awareness and sharing of past work with the TVD team
- Presentation of the functional block matrix, the functional assessment grid and the draft value assessment methodology.
- Support to the team in the target costing and justification process.

### Phase 3: Design

Trajectory mapping visualizes user movements and workflows within the proposed spatial layout. For instance, in the IT department project, trajectory mapping uncovered inefficiencies in researcher and student access to shared lab facilities, prompting adjustments to corridor layouts and access points. The trajectories will be used to analyze typical days or weeks for typical users. These trajectories will then be reused at various points in the project to assess the value of the proposal from the perspective of different users.

Collaboration sessions bring together all project stakeholders—designers, users, and in the High School case, contractors—to collaboratively evaluate design decisions. These sessions provide real-time feedback, enabling stakeholders to address potential issues early and maintain alignment with value objectives. Workshops will be conducted to 1) evaluate possible solutions using the functional evaluation grid, the agreed value assessment methodology and trajectory analysis, 2) to select the preferred real estate solution using the functional evaluation grid and the agreed value assessment methodology, 3) to create the Proximity matrix (refining functional blocks to include all functional units) to provide the design team with the granularity needed to refine the solution.

3P workshops focus on analyzing and optimizing critical flows, such as the movement of people, materials, and information. Documentation of functional links and expected real estate responses are described to the design professionals via a reference table (details of each link and the reason for it). Identification of critical functional units and/or critical links (these will need to be tested with customer representatives to validate key functionality through computer simulations, full-scale or life-size mock-ups are used to evaluate service delivery processes, enhancing stakeholder awareness of how spatial configurations influence academic activities. For example, Kaizen workshops in the secondary school project improved the delivery of pedagogical services by streamlining classroom and corridor layouts.

The Validation phase concludes with a reassessment of the proximity matrices and functional evaluation grids to ensure alignment between stakeholder priorities and design decisions.

### Phase 4: Iterative Design and Refinement

The iterative design phase incorporates user journey mapping and simulations to validate the alignment of design solutions with user needs. Collaborative workshops facilitate iterative feedback loops, allowing stakeholders to refine designs in real-time. Functional connections matrices are further developed to ensure that all spatial and operational relationships are documented and aligned with project goals.

Simulation-based validation exercises, such as traffic flow analysis and space utilization studies, are employed to test and refine critical design components. These exercises help identify potential risks and opportunities for improvement, ensuring that the final design optimally supports academic workflows.

The final phase incorporates functional and user journey audits to ensure that all design elements align with the defined project objectives. Validation workshops about functional units or critical functions with end-users, including professors and students, provide additional opportunities for feedback and refinement. Functional audits (validation of compliance with required functional links) and user path audits (validation of paths, associated risks and opportunities for improvement) are combined with exception handling mechanisms embedded into the process to address any deviations from established design parameters. These mechanisms ensure transparency and maintain alignment with stakeholder-defined value throughout the project lifecycle.

**Summary**

The integration of 3P into the TVD process should enhance value delivery by embedding user perspectives into every stage of the project lifecycle. This framework could ensure that critical functionalities are preserved while fostering collaboration and innovation. By leveraging tools like proximity matrices, evaluation grids, and iterative workshops, the proposed methodology addresses common gaps in traditional project delivery and optimizes outcomes for all stakeholders.

# DISCUSSION: THE ROLE OF ALIGNMENT IN VALUE MANAGEMENT

The findings from the case studies underscore the pivotal role of alignment in achieving effective value management within TVD projects. Alignment involves the continuous synchronization of project decisions with stakeholder-defined value, ensuring that all design elements and processes remain consistent with user needs and project objectives throughout the project lifecycle (Ballard, 2012). This principle is particularly crucial in academic settings, where dynamic and diverse stakeholder requirements can create challenges for traditional project delivery methods.

In the university IT department project, alignment is achieved through tools such as trajectory mapping and functional evaluation grids, which facilitates real-time adaptation to stakeholder feedback. For instance, the use of trajectory mapping helps identify workflow bottlenecks in shared lab spaces, prompting design adjustments that optimize spatial configurations. These findings align with the broader principles of Lean Construction, which emphasize iterative feedback and stakeholder collaboration as mechanisms to enhance project outcomes (Womack & Jones, 1996).

Furthermore, the alignment of design solutions with stakeholder priorities will contribute to a significant reduction in late-stage design changes. This was exemplified in both case studies, where collaborative workshops enabled stakeholders to collaboratively address conflicts early in the design process. Such early resolution of issues not only minimized costly rework but also reinforced stakeholder ownership of the project, a key factor in achieving satisfaction and trust (Salvatierra-Garrido et al., 2010).

Despite its benefits, achieving alignment requires considerable investment in stakeholder engagement and iterative validation processes. As highlighted by Giménez et al. (2022), the time and resource demands of participatory design can be a barrier to its widespread adoption. This challenge was evident in the case studies, where maintaining alignment necessitated multiple workshops, simulations, and audits. Future iterations of the framework should consider integrating advanced digital tools, such as building information modeling (BIM) and automated functional link matrices, to streamline alignment processes and reduce the associated resource burden (Forgues & Brunet, 2018).

Another critical observation is that alignment is not solely a technical challenge but also a sociocultural one. The case studies revealed that fostering alignment required building a shared understanding of project goals among diverse stakeholder groups, including professors, students, and administrators. This finding aligns with the work of Khalife and Hamzeh (2023), who emphasize the importance of social dynamics in managing value in Lean Construction projects. Incorporating participatory methods like 3P workshops and user journey simulations helped bridge gaps in stakeholder perspectives, ensuring that alignment was maintained across varying priorities.

By embedding alignment as a core principle, the proposed framework offers a robust approach to managing value in TVD projects. It integrates participatory tools and iterative processes to dynamically adapt to stakeholder needs, while fostering collaboration and transparency. This framework aligns with the evolving demands of academic infrastructure projects, offering practical strategies to balance cost-efficiency, flexibility, and user satisfaction.

# CONCLUSIONS AND FUTURE RESEARCH

The study contributes a novel framework for managing value in TVD projects by integrating 3P and participatory methods. The cases gave some hints on the framework's effectiveness in aligning user-defined value with project outcomes, fostering collaboration, and optimizing design processes in complex and evolutive settings such as academia or healthcare.

The framework requires further validation in diverse contexts and project types. While the framework should address many limitations of existing tools like VAM and VAL, challenges remain. The integration of human-centered design (HCD) revealed gaps in the ability of qualitative insights to inform quantitative metrics. Future iterations of the framework will explore hybrid approaches to bridge these gaps.

Future research will focus on automating tools like functional connections matrices and improving traceability mechanisms to enhance the framework's scalability. Additionally, integrating advanced requirement management tools from software development may address gaps in dynamic value alignment and strengthen the connection between qualitative insights and quantitative metrics.

By embedding participatory and iterative processes into TVD, this framework offers a pathway for academic institutions to create adaptable, innovative, and user-centric infrastructure.

# REFERENCES


Alarcon, L. (Ed.). (1997). *Lean Construction*. Taylor & Francis.

Ballard, G. (2012). Target Value Delivery. In Tzortzopoulos, P., Kagioglou, M., & Koskela, L. (Eds.), *Lean Construction: Core Concepts and New Frontiers* (pp. 148–161). Routledge.

Forgues, D., & Brunet, M. (2018). Lean-led, evidence-based, and integrated design: Toward a collaborative briefing process. In Luo, Y. (Ed.), *Cooperative Design, Visualization, and Engineering* (pp. 78–85). Springer. https://doi.org/10.1007/978-3-030-58325-8_7

Giménez, Z., Mourgues, C., Alarcón, L. F., & Mesa, H. (2022). Exploring value generation in Target Value Delivery applying a value analysis model. *Buildings*, 12(7), 922. https://doi.org/10.3390/buildings12070922

Howell, G., Laufer, A., & Ballard, G. (1993). Interaction between subcycles: One key to improved methods. *Journal of Construction Engineering and Management*, 119(4), 714–728. https://doi.org/10.1061/(ASCE)0733-9364

Khalife, S., Emadi, S., Wilner, D. & Hamzeh, F. (2022). Developing Project Value Attributes: A Proposed Process for Value Delivery on Construction Projects. *Proceedings of the 30th Annual Conference of the International Group for Lean Construction (IGLC30)*, 913–924. https://doi.org/10.24928/2022/0202

Khalife, S., & Hamzeh, F. (2023). *Developing advanced approaches to deliver value on construction projects: Integrating social dynamics, digital modeling techniques, and lean concepts*. [Doctoral dissertation], University of Alberta ERA Library.

Lukka, K. (2003). The Constructive Research Approach. In L. Ojala & H. Olli-Pekka (Eds.), *Case Study Research in Logistics (pp. 83–101). Turku: Turku school of economics and business administration*.

March, S. T., & Smith, G. F. (1995*)*. Design and natural science research on information technology. *Decision Support Systems*, 15(4), 251–266. https://doi.org/10.1016/0167-9236(94)00041-2

Ramakrishnan, S., & Testani, M. V. (2011). An integrated lean 3P and modeling approach for service and product introduction. *IISE Annual Conference.Proceedings,* , 1-8. Retrieved from https://www.proquest.com/scholarly-journals/integrated-lean-3p-modeling-approach-service/docview/1190336793/se-2

Salvatierra-Garrido, J., Pasquire, C. & Thorpe, T (2010). Critical review of the concept of value in Lean Construction theory. *Proceedings of the 18th Annual Conference of the International Group for Lean Construction (IGLC18)*, 33-41. https://iglc.net/Papers/Details/695

Tillmann, P. A. & Eckblad, S. (2023). Managing human-centered innovation within TVD in healthcare project. *Proceedings of the 31st Annual Conference of the International Group for Lean Construction (IGLC31)*, 1082–1091. https://doi.org/10.24928/2023/0190

Womack, J. P., & Jones, D. T. (1996). *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. Simon & Schuster.