

STRATEGIC DESIGN MANAGEMENT FOR SUSTAINABILITY: PROCESS GOVERNS OUTCOME

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Summary

The complexity of sustainability issues reveals the limitations of the traditional fragmented approach to building construction, and calls for more increased collaboration, particularly in design. Target Value Design (TVD) is an integrated design approach that increases predictability in classical management parameters (e.g. time, cost, quality) by addressing uncertainties and constructability through a systematic and iterative design discourse. It encourages harvesting synergies and closing loops, and facilitates designing in harmony with local ecological and social contexts. This study examines the robustness of the TVD process in managing the delivery of the “wicked problem” of sustainability. The key findings are the need to make the sustainability values explicit, in order for the team to create a unified vision and articulate actionable objectives. In addition, the trans-disciplinary nature of sustainability calls for a mind shift to a systems thinking approach to problem framing and value creation. This study has both practical and theoretical implications.

Keywords: Value Management, Sustainability, Regenerative Design, Collaboration

1 Introduction

Sustainability issues are complex and intertwined with building construction and facility operations. Yet design and construction persist in a linear, fragmented manner that is ill-equipped to manage such trans-disciplinary problems. This incompatibility is tolerated until challenged by a “wicked problem,” which demands a solution that lies beyond the boundaries of the current process. Such a challenge is the designing of sustainability at a regenerative level (du Plessis, 2012).

Current sustainability paradigms are largely represented as a formulaic approach to green building that relies on the aggregation of the metrics (du Plessis 2012), but regenerative design promotes a ‘co-evolutionary, partnered relationship between humans and natural systems’ that responds to the unique attributes of place (Cole 2012). The complexity of designing with a holistic living systems worldview requires the design team to adopt a more integrative design approach, and suggests a blurring of traditional knowledge boundaries.

The articulation of sustainability in the design phase of a project provides the greatest opportunity for increased value generation for the lowest cost (Rekola, Mäkeläinen, & Häkkinen, 2012) and the inclusion of sustainability discussions in value management practices can help bring issues to the forefront before critical decisions are made (Abidin & Pasquire 2005).

1.1 Innovations in Design and Value Management – Target Value Design

Design management, the management of the *process* of design, is an emerging discipline in the architecture and construction industry. Innovative design practices such as Integrated Project Delivery (IPD) have revisited the decision hierarchy and broadened the membership of the core design team to include owners, constructors and trade expertise. This collaboration work is incentivized through shared risk/reward contractual agreements, project alliancing and partnering (Lahdenperä, 2012). Early empirical research reveals an emphasis on the organizational structure of the design practice and the management of the design product (Sebastian, 2004), while more recent studies examine the ability of a design process to *predictably* deliver the project, as measured by classical management parameters (e.g. time, cost, quality) (Ballard, 2012).

The management of value, by contrast, stems from the manufacturing industry, where completed work is evaluated by a third party at fixed points in the design process. However, the inherently ‘prototype’ nature of the construction product would suggest a team-based methodology proposed by Male et al.(2007) to leverage the opportunities for value creation in design (Thyssen, Emmitt, Bonke, & Kirk-Christoffersen, 2010), and to provide continuous guidance throughout the highly complex construction process.

Target Value Design (TVD) is one such strategic approach to design management that is characterized by a central focus on owner value. Developed within the lean construction community, this process increases predictability of classical management parameters (e.g. time, cost, quality) by addressing uncertainties and constructability through a systematic and iterative design discourse (Ballard 2012) (Figure 1).

The explicit value proposition is derived from the business case, validated to market cost, and continuously optimized through component design and estimating. The increasing granularity of design decisions effectively redistributes the accountability for value to all team members, and renders the role of the design manager, already poorly defined in a traditional design process, even more ambiguous (Mills & Glass, 2009). The core design team typically includes project managers representing the owner, designer and contractor, who either co-locate in a common space or meet on a regular weekly basis. Component teams are also formed early, in order to facilitate the constructability input from trades and the supply chain. This collaborative work environment provides a structure that can accommodate the theoretical dichotomy between the cyclical nature of the design process in contrast with the linear nature of the construction process (Mitchell, Frame, & Coday, 2011), by allowing for a more ‘cooperative professional exchange between design team members’ (Cole, 2012).

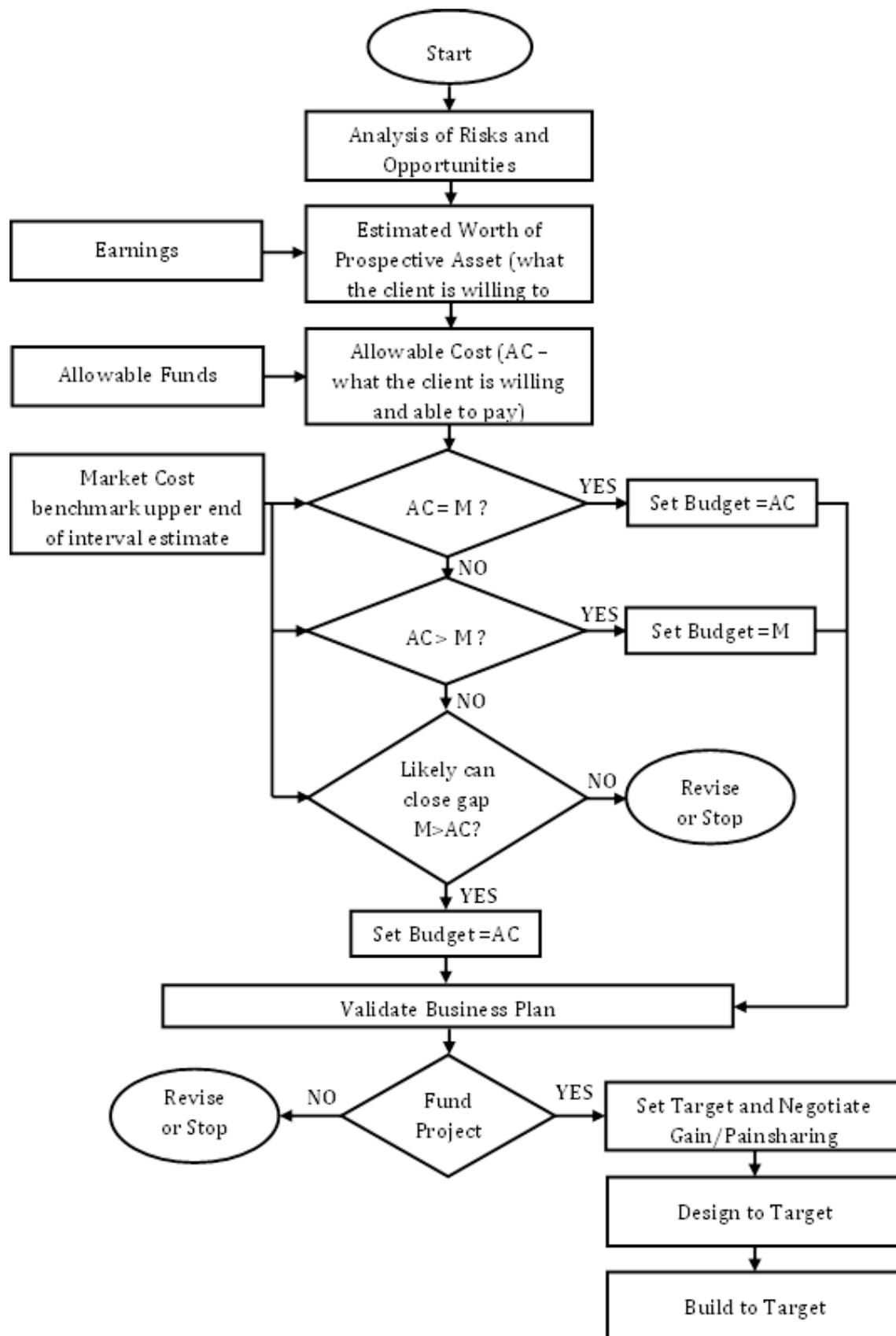


Fig. 1 TVD Process, Ballard (2012)

While the practice of TVD has demonstrated incremental gains in continuous value management, this research examines the robustness of the process in managing the delivery of the ‘wicked problem’ of sustainability, and seeks to understand the key constraints and preconditions. Specifically, the research seeks to better understand the effects of sustainability on the balance of power between developers, designers and construction companies (Rekola, Mäkeläinen, & Häkkinen, 2012), and the types of new competencies and understanding of sustainability that is needed by the actors involved.

2 Research

The limits of the current evolution of the TVD process were explored through case study research, by evaluating the *ability* of the process and the *capability* of the team in the delivery of sustainability values. An exemplary design team was selected, wherein all of the parent organizations (e.g. designer, contractor and health care owner) were industry leaders and innovators of lean practices. The core design team had the additional advantage of a four year working history over the course of a multi-phase project, which provided the opportunity to refine the practice of TVD. The survey and interview data instruments were designed to explore the challenges of the delivery of sustainability and served as a filter to reveal the limitation of the current TVD process.

3 Findings

The validity of the findings was premised on the advanced TVD skill of this team, their history of successful and exemplary projects, and their strong commitment to sustainability. Researcher observations of the nine member core team meetings confirmed a high degree of inter-disciplinary collaboration, active involvement of the owner and user groups, and a shift in the design focus from pure cost to a discussion of worth. This was validated through survey and interview data, which identified an agreement regarding the desirability of the TVD process to reduce stress, increase collaboration and offer discursive consideration of multiple design options (Figure 2).

Impact of TVD on team culture and on work.	Participant
“Higher confidence level on budget, reduces user angst, a lot less argumentative.”	O2
“More rigorous, fewer surprises.”	A1
“More exacting, demanding of real-time work.”	A2
“More intense, higher value use of time, higher level of contribution.”	C1
“More efficient, clear expectations, less stressful.”	C2
“TVD changes the culture from the old report-out method of communication.”	C2
“Requires continuous communication, observations, and feedback. The reward is more confidence, more control over the details and the budget.”	C3
“The open forum of communication reduces the angst.”	C4
Participant Coding: O wner, A rchitect, C ontractor and participant number	

Fig. 2 Delta between Target Value Design and traditional design management

However, there was an identifiable discrepancy in participant responses regarding the understanding of the sustainability goals (Figure 3). While all team members acknowledged the leadership and visionary commitment of the owner to sustainability, and showed willingness to explore sustainability goals beyond the specified green building metrics, there was no process in place to facilitate this level of problem framing and solving.

What are the goals on this project related to sustainability, and how were they stated?	
Participant Answers:	Participant ID:
Stated as Vision, LEED was a work tool for accountability	O2, C4
Stated as Metrics, in Owners Project Requirement	O1, C1
Stated as Green Guide for Healthcare, then LEED	A1, A2, C3
Goals ongoing and evolving. Metric was LEED	C2
Participant Coding: Owner, Architect, Contractor and participant number	

Fig. 3 Perceptions of sustainability goals

Three linked conditions of causation were identified as creating the gap in the current design management system (Figure 4):

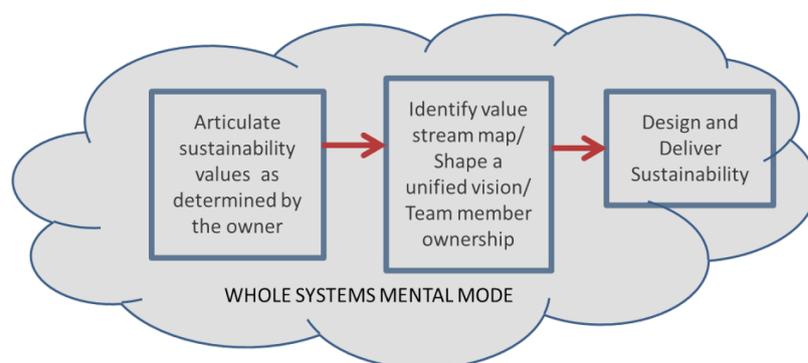


Fig. 4 Linked conditions for design of sustainability

- **Whole systems mind set.** The complexity of buildings and sustainability represent a paradoxical co-dependency of product and process. Thus, the understanding of both problems and solutions for regenerative design of the built environment transcends the consideration of the parts in isolation. While the TVD design has the ability to facilitate this dialogue, the capability of the team to engage is dependent on their individual abilities to adopt a whole systems mind set. In the case study, the team members were hesitant to participate in discussions outside of their immediate field, even concerning problems of a general nature that extended beyond traditional disciplinary boundaries.
- **Rendering sustainability values explicit.** The sustainability goals as stated in the green building criteria did not capture the full extent of the owner’s vision of

sustainability, yet there is an inherent difficulty in reconciling the complexities of systemic nature of sustainability with actionable goals. One solution is suggested by the discursive nature of the TVD itself, which provides a platform for early consideration of ‘stretch’ goals of regenerative sustainability. Even the exercise of trying to articulate these values as goals can help identify parameters and overall direction. This level of discussion would rely on the capability of the team members to adapt a whole systems mental model.

- **Unified vision.** While the participants self-identified the ‘team’ as an entity and as the driving force behind the value management of TVD, they pointed to the owner as the ‘champion’ of sustainability. Paradoxically, the owner voiced his frustration over the inability to transfer the ‘ownership’ of the sustainability vision to the other team members. This can be partially understood by the difficulty in relating some of the sustainability issues to individual disciplines, but could also correlate with the lack of articulation of the sustainability vision beyond generalities. An additional finding of the research was the opportunity for TVD to serve as the platform for continuous value engineering through the iterative design and estimating process. This same distributed responsibility for value management could be extended to sustainability values.

4 Discussion

The practice of Target Value Design has demonstrated incremental gains in continuous value management, improved predicatability in construction, and reduced costs by closing loops and harvesting synergies (Ballard 2012). The collaborative work environment of TVD, as well as the systematic and iterative design discourse provides the framework that can cope with the complexity of holistic sustainability issues. However, in addition to the *ability* of the TVD process, the research points to need to render the sustainability values explicit, in order to create a unified vision and articulate actionable objectives, and the *capability* of the design team to adopt a whole systems approach to problem definition and value creation. Future research on intervention methods to address the identified gaps and knowledge management mapping of sustainability in an integrated continuous value management process can contribute toward the increased implementation of regenerative sustainability design.

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