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Prerequisites of Value-centric Project Environment in Manufacturing Organisation: An Empirical Investigation and Structural Framework

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Abstract

Value-driven project management in manufacturing organizations plays a pivotal role in ensuring projects align effectively with strategic organizational goals. Despite its significance, there remains a noticeable gap regarding structured frameworks for implementing value-oriented principles. This research addresses this gap by developing a foundational framework for value-focused project organizations, identifying twelve critical factors derived from a comprehensive literature review, expert validation, and empirical insights. A survey involving senior executives from project-based manufacturing firms in Maharashtra, India, evaluated the importance of these identified factors. Interpretive Structural Modeling (ISM) and MICMAC analyses were utilized to understand factor interdependencies, classify these variables, and develop a hierarchical structural model. The results highlight monetized value capture, value-centric strategic approaches, and project-organization integration as fundamental drivers. Conversely, stakeholder engagement and knowledge harvesting depend significantly on achieving strategic alignment. This study contributes practically and theoretically by presenting a clear and user-friendly structural framework, enhancing project governance and facilitating sustained value realization. By combining theoretical knowledge with practical insights, the research establishes a dependable basis for value-oriented decision-making and organizational structuring. The framework proposed is readily implementable, consistently applicable, and adaptable for continuous improvement, thereby ensuring long-term project success.

Major Findings: *The study identifies monetized value capture, a value-centric strategic approach, and effective integration of projects with organizational structures as fundamental drivers in value-driven project management. It also reveals that stakeholder engagement, knowledge harvesting, and innovation critically depend on achieving strategic alignment within the organization. Furthermore, the research presents a clear, practitioner-validated framework designed to improve governance, facilitate informed decision-making, and ensure sustainable long-term value realization in manufacturing organizations.*

Keywords: *Effective Integration of Projects, Innovation, Knowledge Harvesting, Monetized Value Capture, Stakeholder Engagement, Strategic Alignment, Value-centric Strategic Approach*

1.0 Introduction

The approach of project management research in manufacturing organisation has been shifting from "product creation" to "value creation"[1]. Research focuses on exploring future opportunities at the broader business level, adopting a value-centric approach in the project environment[2-4]. This approach is evolving while moving

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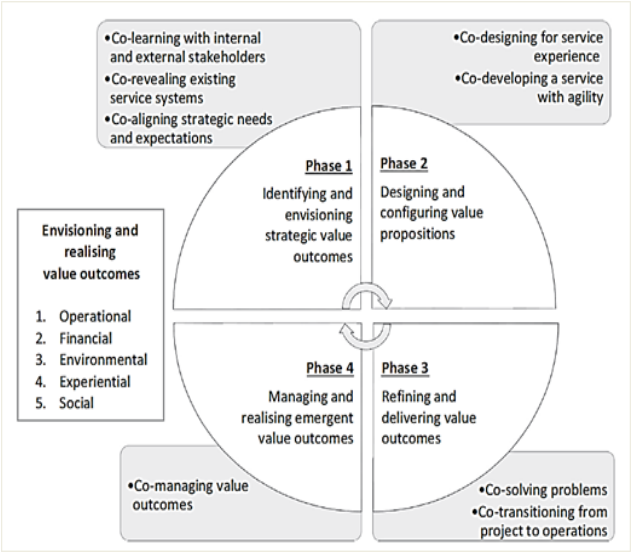


Figure 1. Value co-creation model by Marcos, Hedley, Andrew[15].

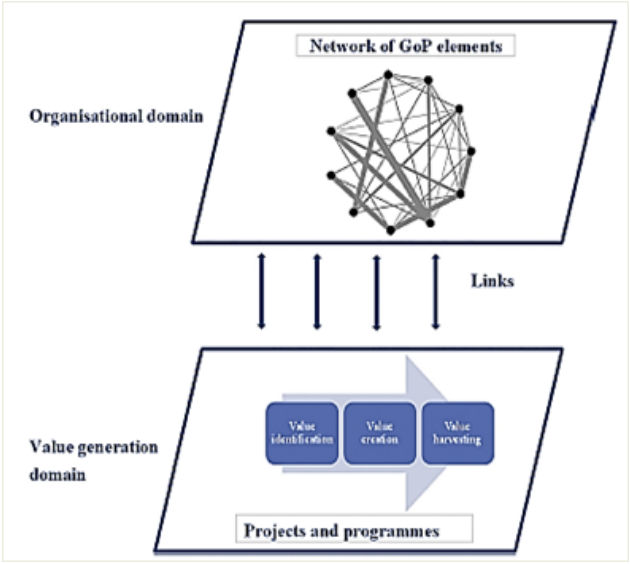


Figure 2. Theoretical framework of GoP, linking the organisational and value domains by Eva, Magnus, Hellström, Kim[16].

forward from traditional project-based practices, which are increasingly considered inadequate[5-7]. More recent research has emphasised the need for research that goes beyond projects and looks at the big picture of how to align projects, programs, and organisations strategically for the long term[8-10]. Although researchers have started looking at project governance from different theoretical angles, which has led to the creation of many frameworks, there is still no agreement on what the basic parts of a project governance model should be[11]. Despite exploring innovative models and theories that cater to complex project dynamics, which is a recurring theme, little is known about the structure of value-centric project organisations[12,13]. Research is needed to explore models that facilitate strategic discussions, ensure project maturity, and align projects with organisational value systems[14]. Following are a few of the existing value process models in research work, which give us an ample base for research work[15,16].

Although extensive work is done to identify the requirements of value management, the clarity in specific factors in value-centric organisations and their linkages, dependencies, and nature is not clear from a practitioner's point of view.

Existing theories do not adequately address the complexities of value dynamics in project organizations[13,17]. Traditionally viewed as temporary entities within parent organisations, projects often operate with minimal systemic integration[18]. To address challenges in the modern business landscape, organisations must adopt a value-centered approach that seamlessly integrates projects, programs, and organisational processes[19]. Many existing conceptualisations remain incomplete, frequently blurring the boundaries between governance and management and organisational factors; rather than traditional hierarchical structures, they play a crucial role in generating value[19,20]. This might be because research studies in project management are mostly conducted at the level of a single project or program, whereas studies at the level of multiple projects or programs or at the organisational level remain relatively rare[6,21]. Also refer the following work by researchers Pargar, Kujala, Aaltonen, Ruutu[22].

Practitioners need to clearly decipher and implement the complexities in value dynamics, as demonstrated in research work, in empirical settings[22]. Research articles, despite aiming at practitioners, fail to present a practitioner-friendly value management organisational structure or process model[23]. In fact, research tools emerging from value management are not widely exercised[24], due to a lack of researcher collaboration with practitioners[25]. However, there is still a lot of room to show how easy and clear it is for practitioners

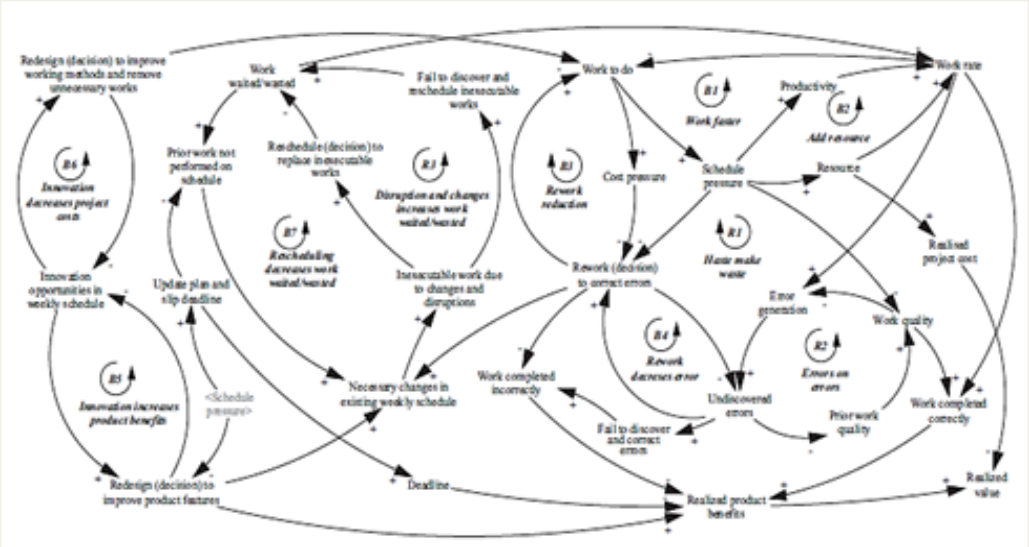


Figure 3. The interrelations among processes and their impact on value creation by Pargar, Kujala, Aaltonen, Ruutu[22].

to understand and use value management in the real world[16]. Scholars advocate for the development of value-centric strategic frameworks to balance and optimise these insights, ensuring their applicability in practical settings[10,13,26].

Furthermore, critics advocate an innovative approach that integrates interdisciplinary perspectives[4,27]. These opportunities primarily focus on fostering collaboration and leveraging collective expertise. This evolving perspective suggests the research needs to integrate a value management framework into a broader, holistic approach that aligns with a long-term organisational strategy which is practitioner-orientated[9,28-31].

To summarise, this article explores two broad problem areas of value-centric organisation: (a) The unavailability of an organisational framework showing clear interrelations, dependencies, and the nature of key organisational factors (b) The availability of a realistic process model from practitioners perspective. This article's goal is to present a value-centred framework of 12 important organisational factors that is clear, reliable, easy to understand, and can be used. It is based on strong theoretical knowledge from previous research work.

The paper is structured as follows: Section 2 is an extended literature review to form a theoretical framework while identifying factors. Section 3 details the methodology for the research work and empirical survey and analysis based on the identified factors. Section 4 dedicates itself to a detailed ISM analysis and the creation of a factor diagram. Section 5 is a discussion to create a detailed structural model of factors. Section 6 concludes the study and outlines potential future research directions.

2.0 Literature Review

Research into how temporary projects in manufacturing organisation effectively generate value from the wider perspective of a permanent organisation is scarce[16]. Programs, with their inherent complexities, demand an advanced understanding of value generation, capture, and delivery[32]. Value management is an important strategic method that has become a nodal point of interest in research because of its ability to improve project and organisational value for stakeholders[4,33]. Setting up a well-thought-out organisational framework that includes value-enabling mechanisms in the way organisations are designed can lead to future value-oriented project cycles that help achieve strategic goals and keep stakeholders happy[19,34]. Structures that facilitate value flow and knowledge sharing between projects will lead to long-term success and strategic alignment[13,26]. It is also important to understand how valuation mechanisms

and organisational design work together[32]. Finding the necessary factors for value-centred organisations in the existing literature is the main goal of this paper. Aligning value-related factors with program management also makes coordination run smoothly, so value creation doesn't get slowed down[34].

The interplay between product development, organisational design, and value creation highlights the necessity of understanding to minimise misalignments in value systems and program management[16,35]. Further, value management must be a flexible process, capable of addressing both well-defined and uncertain scenarios[36]. Further, modern organisational designs advocate a flexible, network-based approach, where participatory governance and distributed functional collaboration are used[37,38]. Therefore, with this literature review, contributes to build a strong theoretical base for the organizational framework while identifying 12 key value-centric factors, as discussed below. Subsequently, we shall build their relational model to understand their complexity and interrelationships with ISM. These are detailed as followings.

2.1 A Long-term Value-centric Approach

Value-centric organizations must integrate strategic management practices and project governance to align projects with broader organizational objectives[39]. Adopting a value-driven mindset fosters sustainability and long-term growth, and strong connections between projects and organizational strategies enable value alignment[40,41]. Organizations must address gaps in connecting early project phases to long-term outcomes and embed strategic benefits early in project planning[4]. Emerging strategic management practices emphasize the need for value integration across projects, programs, and portfolios to ensure alignment with overarching objectives[42]. Individual projects have been studied a lot, but programs, which are made up of projects that depend on each other, need a more complex strategic focus[34]. Despite their importance, program dynamics remain an underexplored area in research[43].

2.2 Integrate of Temporary Project Organization to Parent Organization

Traditionally, organisations view projects and programs as temporary entities that operate with minimal integration until completion[5,18]. However, dynamic business environments necessitate strong connections between projects and organizational systems to enhance value delivery[44,45]. Effective alignment of projects with strategic goals drives value creation, benefits stakeholders, and strengthens organizational positioning[37]. Program management plays a critical role in bridging project execution with strategic objectives[27,28,34]. The strategic triad of portfolio, program, and project management ensures a holistic approach to value creation[23]. Well-aligned projects act as catalysts for organisational success.

2.3 Link Project Value to Strategic Value

Research indicates that there are important gaps in addressing long-term strategic value in the early stages of a project. This evidence shows how important it is to have strong links to project value[4,11]. Value management serves as a key link between strategic management and project execution, ensuring alignment with organizational objectives[46]. Strategic value integration enhances decision-making across projects and portfolios[47]. Embedding value-centric principles into project management fosters a symbiotic relationship where strategic vision informs execution, driving tangible outcomes. Value management strategies play a crucial role in ensuring project and program alignment with overarching goals[48]. Additionally, incorporating value-driven concepts strengthens the contribution of projects to strategic objectives, making value management a cornerstone of effective planning and execution[49].

2.4 Mechanism for Auto Transfer of Value

The idea of "auto transfer of value" stresses how important it is for organizations to have strong ties with each other so that project results can be easily integrated into larger operations and strategies[50]. Aligning project processes with organisational workflows enhances value creation and operational efficiency[51]. Structural links, overseen by senior management, are crucial for decision-making in project selection and resource allocation. Programs serve as strategic enablers by transferring value across projects, optimizing resource utilization, and ensuring alignment with organizational objectives[5-18]. The iterative nature of projects, adaptive strategies, and parallel trials enables organizations to remain responsive to changing

conditions, enhance resource efficiency, and integrate project outcomes into sustained organizational growth and strategic success[52].

2.5 Integrating Value Processes with Projects Environment

A comprehensive understanding of value processes requires integrating dynamic perspectives and organizational design to enhance adaptability and strategic alignment[16,46]. A holistic "domain" perspective incorporating processes, methodologies, and tools strengthens value management[28,38]. Process-orientated project selection ensures alignment with strategic goals and customer value propositions[43]. Project relationships drive organizational evolution by highlighting interconnected project management contexts[26,43]. Despite progress, research gaps persist in treating value as a static concept rather than a dynamic lifecycle process[4,53]. Advancing theoretical frameworks is crucial for capturing complexities in value creation and acquisition[54]. Tailored program designs incorporating organizational forms, control mechanisms, and funding sources optimize value realization. Adaptive approaches are essential for managing process complexity and maximizing value opportunities in dynamic project environments[55].

2.6 Engage External Stakeholders for Value Creation

Value-driven project success relies on fostering collaboration, aligning stakeholder goals, and strategically negotiating value throughout the project lifecycle[56]. The project manager plays a critical role as a mediator, integrating diverse stakeholder values with project objectives. Balancing qualitative use value with monetary exchange value introduces complexity in evaluation and negotiation[8]. Interorganisational projects further heighten this complexity, requiring continuous stakeholder alignment and negotiation[38,57]. Early alignment mitigates risks and enhances value delivery. Negotiation is a practical strategy for defining and optimising value in project management[55]. A holistic approach to value creation integrates internal and external stakeholders, particularly in multiorganizational systems[57]. Collaborative value exploration strengthens outcome-based services, ensuring strategic alignment with client expectations.

2.7 Common Forum for Structured Knowledge Management and Sharing

Collaborative platforms are essential in project management, facilitating stakeholder engagement and value-driven outcomes. Interdisciplinary approaches integrating value engineering, system integration, and cultural alignment strengthen strategic thinking. Project managers use these platforms to align expectations through discussions, surveys, and workshops[58]. Project management on organisational platforms aligns project objectives with strategic goals through governance structures, risk management, and collaborative multi-actor efforts. This integration fosters innovation, enhances value creation, and drives sustainable growth.

Effective communication, grounded in empathy and trust-building, fosters shared ownership and stakeholder alignment[59]. Organisational learning, knowledge sharing, and knowledge management are critical for efficient decision-making. Knowledge management and sharing practices enhance stakeholder confidence. Specializations and co-specializations ensure contributions are effectively integrated, increasing platform-level value. Addressing conflicts and ensuring fair value distribution sustain long-term engagement[60-64].

2.8 Involvement at the Front End of the Project

Lack of foresight in functional ownership hinders long-term value capture in project management. Risks are lower and results are better when stakeholders are involved in co-creating value early on in the front-end phase. Decisions made early in a project significantly impact success, shaping value throughout its lifecycle[65,66]. Despite academic consensus on front-end focus, implementation often falls short[17]. Value creation relies on structured stakeholder interactions, requiring proactive change and risk management to prevent disruptions[4].

2.9 Knowledge Harvesting for Future Projects

Ongoing research highlights the significance of knowledge harvesting, stakeholder engagement, and

strategic value assessment in achieving sustainable and innovative project outcomes. Human-resource-driven organizational capabilities are central to value creation, requiring effective governance and project maturity through upskilling and strategic education[53]. Knowledge-harvesting processes facilitate collaboration and informed decision-making, aligning project practices with sustainability goals[62,64]. Value harvesting is crucial in uncertain environments, necessitating iterative assessments and flexible frameworks[67].

2.10 Practice of Innovation and Experimentation

Innovative project management strategies, particularly those incorporating trial-and-error approaches, enable flexibility and creativity, allowing projects to adapt and uncover new opportunities[52]. The ability to balance creativity with structure enables organisations to uncover new value and drive long-term success in increasingly complex and dynamic environments, where all functional stakeholders leverage unique technological or resource inputs for individual value creation while also contributing to collective value. Researchers emphasise the importance of experimentation as a foundational element of innovation in project management, with adaptive methodologies being crucial for achieving innovation-driven outcomes[68]. In addition, researchers also provide a historical perspective on value management, demonstrating how it has evolved to support innovative outcomes in project execution, underscoring the importance of structured methodologies in the effective management of innovation projects[69,70].

2.11 Enhanced Role of Project Manager

Project manager's roles have evolved from task-specific responsibilities to strategic business management, which requires alignment with organizational objectives. Project owners play a crucial role in ensuring governance structures connect projects with broader strategic goals. This shift necessitates a value-driven, holistic approach that integrates governance, value creation, and organizational learning. Project Portfolio Management Offices (PPMOs) provide structured support, aligning project portfolios with business strategies. PMOs and project managers translate strategic goals into tangible outcomes, ensuring project success within the organizational context[59]. Managing emergent value outcomes and leveraging system integrators enables continuous value generation throughout the project lifecycle[16,48]. The PMO acts as a central hub linking projects, overseeing performance, and fostering competencies[63]. By supporting project managers and enhancing organisational learning, PMOs align projects with strategic goals, improving overall project and organization performance.

The summary is in the following table

Table 1. Summary of literature review

S. No	Factors Identified	Essence of Literature Review	Key References
1	Long-term value-centric approach at core	Aligning projects with organizational strategy ensures sustainability and growth, though program dynamics remain underexplored.	4,34,39,40,41, 42,43
2	Integration of temporary project organizations	Enhances value delivery and strategic alignment through portfolio, program, and project management.	5,18,23,27,28, 34, 37,45,59
3	Linking project value to strategic value	Robust value management ensures project execution aligns with long-term strategic goals.	4,11,46,47,48,49
4	Mechanism for auto-transfer of value	Seamless integration of project outcomes into strategies enhances efficiency and sustains long-term value.	5,18,26,50,51,52

5	Integrating value processes with project environment	Dynamic methodologies and holistic frameworks optimize value realization in evolving business contexts.	4,16,28,38,43,46,53,54,55
6	Engaging external stakeholders for value creation	Collaboration and early alignment enhance project success, particularly in complex environments.	8,38, ,55,56,57
7	Common forum for structured knowledge management	Enhances collaboration, learning, and decision-making, fostering innovation and strategic alignment.	57,58,59,60,61,62,63,64
8	Involvement at the front end of the project	Early stakeholder engagement mitigates risks and optimizes project and portfolio outcomes.	4,17,65,66,
9	Knowledge harvesting for future projects	Ensures continuity, innovation, and strategic alignment through collaborative platforms and flexible frameworks.	53,62,64,67
10	Practice of innovation and experimentation	Balancing structured and flexible approaches fosters creativity and long-term value creation.	52,68,69,70
11	Enhanced role of project manager	Expanding beyond task execution to strategic alignment and value creation ensures business success.	16,48,59, 63

3.0 Methodology

Following methodology is used for this research article.

3.1 Step 1: Brainstorming with Experts

The 11 factors, as an outcome of the literature review were discussed with senior individuals from project

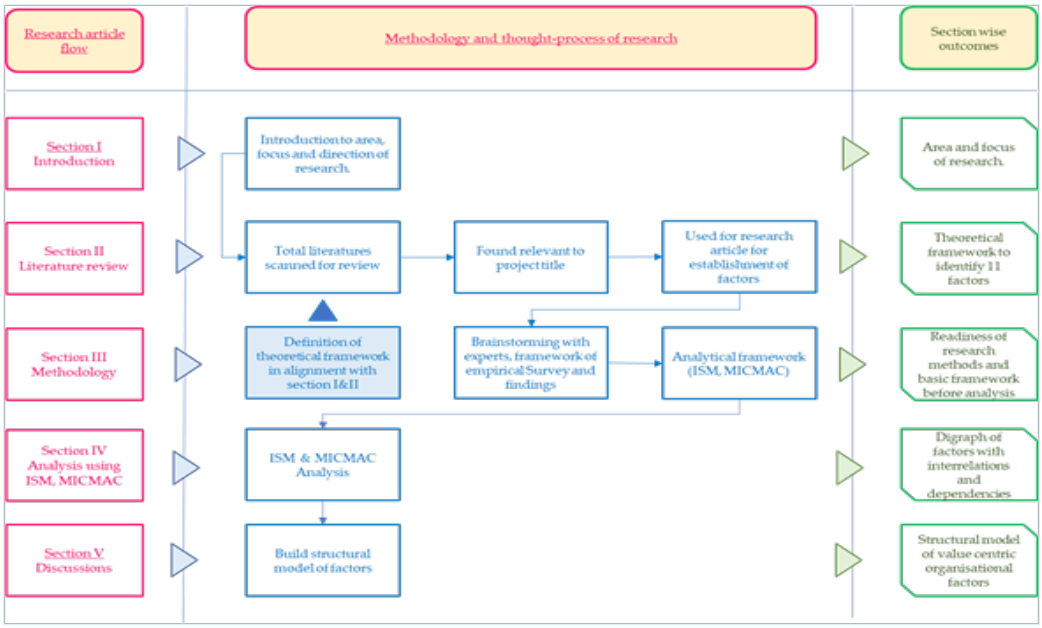


Figure 1. Steps followed for the methodology.

Table 2. List of final variables after discussions with practitioners

Factor No	Concise Terminology for Defining Factors (After Discussions with Practitioners)
F1	Value-centric strategic approach
F2	Integration of projects to organization
F3	Linking project to strategic-value
F4	Auto transfer of value
F5	Value processes integration
F6	Engaging external stakeholders
F7	Common forum for structured knowledge sharing
F8	Front-end stakeholder involvement
F9	Knowledge harvesting
F10	Innovation and experimentation
F11	Evolving role of project manager
F12*	Monetising value capture

* Monetising value capture is the factor introduced by practitioners.

organizations. They reviewed all the factors and consented for their real-time requirement in the practice. They discussed the titles of the factors and renamed them to reflect their precise terminology. Practitioners emphasized the addition of one more factor *i.e.* 12th factor which is the monetization of value capture.

3.2 Step 2: Empirical Survey and Findings

The questionnaire was developed using 12 factors and structured five-point Likert scale to ensure consistency in responses and facilitate quantitative analysis. Respondents were requested to assess the degree of difficulty they experience in handling associated factors of value-centric organizations, in order to gauge their significance[71]. We recorded their responses on a Likert scale, with 1 indicating "not at all important" and 5 indicating "very important". This organized method helps us to understand the relative importance of factors and correlates in more detail. To check if this empirical analysis is correct, we can compare it to a theoretical ISM analysis.

Survey was administered through self-contact, email, and postal methods in Indian manufacturing industries.

Table 3. Outcome of empirical survey

Factor No	Title of Factor	Mean	Rank
F11	Value-centric strategic approach	4.45	2
F2	Integration of projects to organization	4.39	3
F3	Linking project to strategic-value	4.12	7
F4	Auto transfer of value	3.66	12
F5	Value processes integration	4.08	8
F6	Engaging external stakeholders	3.88	10
F7	Common forum for structured knowledge sharing	4.19	4
F8	Front-end stakeholder involvement	3.96	9
F9	Knowledge harvesting	4.17	5
F10	Innovation and experimentation	4.14	6
F111	Evolving role of project manager	3.81	11
F121	Monetising value capture	4.50	1

Senior executives, including Chief Executives, Managing Directors, General Managers, Works Managers, and other Senior Personnel, were personally approached to obtain their responses. Keeping geographic and resource constraints in mind, the sample size is selected as companies within state of Maharashtra, India. Questionnaires were emailed to these industries along with a cover letter, a self-addressed envelope, and postage. A total of 303 questionnaires were distributed, of which 103 were fully completed and returned, 9 questionnaires were incomplete and, therefore, excluded from further analysis. This resulted in a response rate of 35%, which is considered adequate for such surveys[72]. While most recipients completed the questionnaire themselves, in some cases, senior executives filled them out on their behalf.

F1, F2 and F12 are ranked top 3 factors for attention. The values of mean in ascending order explain the importance of the organizational factors. These inputs are used for validation of results, as elaborated in table 9 of section 5.2.

3.3 Step 3: ISM and MICMAC Analysis

This research employs Interpretive Structural Modelling (ISM) as a multidisciplinary method to analyze interdependencies among key factors in value management within value-centric organizations. ISM structures complex relationships into a hierarchical framework, enabling systematic assessment and prioritization of elements to align with value management principles[73]. By integrating insights from project-based environments, the study develops a structured framework to connect theoretical and practical aspects of value-centric strategies[10]. Given the limited application of independent theories in project value creation, this research analyses process factors and variables through ISM[74]. Recognized for its adaptability, ISM has been widely applied across disciplines to model complex systems by identifying interdependencies and enhancing system understanding[75,76]. Rooted in graph theory, ISM transforms conceptual models into structured frameworks, providing systematic insights into relationships and uncertainties[77].

The key stages involved in the ISM process are as follows:

3.4 Step 4: Build Structural Framework

ISM facilitates the hierarchical organization of interconnected elements, supporting strategic decision-making through graphical and descriptive analysis. This iterative methodology effectively maps relationships,

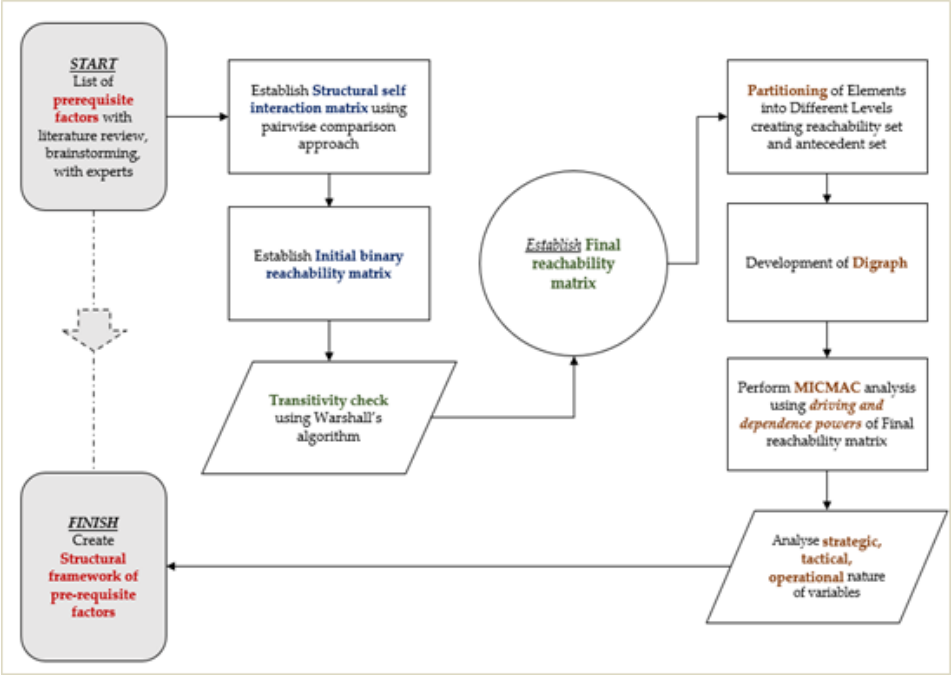


Figure 2. Process flow of ISM analysis.

clarifies the structural significance of factors, and ensures a logical approach to problem-solving. By synthesizing existing knowledge into a single, empirical model, this study bridges theoretical gaps and provides a reliable framework for value-centric organizational design. This is elaborated in Section IV with diagraph and in Section V with actual structural model.

3.5 Step 5: Validation

To check the reliability of the factors and their interdependencies, relations the empirical finding in Table 3 and ISM results in 9 were compared to demonstrate the reliability of structural model in project enviornment. This is detailed in Section 5.2.

4.0 Analysis Using ISM

4.1 Structural Self-interaction Matrix (SSIM)

To start with, all factors which related to the value centric organizational approach are identified through literature review and brainstorming with senior practitioners. To start with ISM analysis, a Structural Self-interaction Matrix (SSIM) is developed for these identified factors. Experts establish relationships between elements using a pair wise comparison approach. The relationships are denoted using the following symbols.

V → Element i influences element j
A → Element j influences element i
X → Mutual influence (both elements influence each other)
O → No direct relationship

4.2 Initial Reachability Matrix

The SSIM is converted into an initial binary reachability matrix by replacing symbols with binary values.

- If element i influences j (V), assign 1 to (i, j) and 0 to (j, i).
- If element j influences i (A), assign 0 to (i, j) and 1 to (j, i).

Table 4. Structural self-interaction matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Value-centric strategic approach		V	V	V	V	V	V	V	V	V	V	A
Integration of projects to organization			V	O	V	O	O	O	V	O	V	O
Linking project to strategic-value				O	A	O	V	O	V	V	O	A
Auto transfer of value					A	O	O	O	A	O	O	A
Value processes integration						O	X	V	V	O	O	O
Engaging external stakeholders							A	A	O	O	A	O
Common forum for structured knowledge sharing								V	A	O	O	O
Front-end stakeholder involvement									A	O	V	O
Knowledge harvesting										A	O	A
Innovation and experimentation											O	A
Evolving role of project manager												O
Monetising value capture												

Table 5. Reachability matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Value-centric strategic approach	1	1	1	1	1	1	1	1	1	1	1	0
Integration of projects to organization	0	1	1	0	1	0	0	0	1	0	1	0
Linking project to strategic-value	0	0	1	0	0	0	1	0	1	1	0	0
Auto transfer of value	0	0	0	1	0	0	0	0	0	0	0	0
Value processes integration	0	0	1	1	1	0	1	1	1	0	0	0
Engaging external stakeholders	0	0	0	0	0	1	0	0	0	0	0	0
Common forum for structured knowledge sharing	0	0	0	0	1	1	1	1	0	0	0	0
Front-end stakeholder involvement	0	0	0	0	0	1	0	1	0	0	1	0
Knowledge harvesting	0	0	0	1	0	0	1	1	1	0	0	0
Innovation and experimentation	0	0	0	0	0	0	0	0	1	1	0	0
Evolving role of project manager	0	0	0	0	0	1	0	0	0	0	1	0
Monetising value capture	1	0	1	1	0	0	0	0	1	1	0	1

- If both influence each other (X), assign 1 to both (i, j) and (j, i).
- If no direct relationship (O), assign 0 to both (i, j) and (j, i).

4.3 Final Reachability Matrix

This was developed while performing transitivity checks using the Warshall's algoritm (if A → B and B → C, then

Table 6. Final reachability matrix removing transitivity

Variables	1	2	3	4	5	6	7	8	9	10	11	12	Driving Power
Value-centric strategic approach	1	1	1	1	1	1	1	1	1	1	1	0	11
Integration of projects to organization	0	1	1	1*	1	1*	1*	1*	1	1*	1	0	10
Linking project to strategic-value	0	0	1	1*	1*	1*	1	1*	1	1	1*	0	9
Auto transfer of value	0	0	0	1	0	0	0	0	0	0	0	0	1
Value processes integration	0	0	1	1	1	1*	1	1	1	1*	1*	0	9

Engaging external Stakeholders	0	0	0	0	0	1	0	0	0	0	0	0	1
Common forum for structured knowledge sharing	0	0	1*	1*	1	1	1	1	1*	1*	1*	0	9
Front-end stakeholder involvement	0	0	0	0	0	1	0	1	0	0	1	0	3
Knowledge harvesting	0	0	1*	1	1*	1*	1	1	1	1*	1*	0	9
Innovation and experimentation	0	0	1*	1*	1*	1*	1*	1*	1	1	1*	0	9
Evolving role of project manager	0	0	0	0	0	1	0	0	0	0	1	0	2
Monetising value capture	1	1*	1	1	1*	1*	1*	1*	1	1	1*	1	12
Dependence Power	2	3	8	9	8	11	8	9	8	8	10	1	

* Cells indicated removal of transitivity section.

A → C is included). With this, driving and dependence power of factors was established[78].

4.4 Partitioning of Elements into Different Levels

For this, reachability sets and antecedent sets are determined. The reachability set of an element comprises the element itself along with all other elements it can influence or connect to within the system. Conversely, the antecedent set consists of the element itself and all other elements that have a direct or indirect influence on it. Further, hierarchical levels within the system by identifying the intersection of these sets are established. This layered breakdown enables a structured, step-by-step analysis,

Table 7. Level Partitioning (LP) to identify the levels of factors

Elements (Mi)	Reachability Set R (Mi)	Antecedent Set A (Ni)	Intersection Set R(Mi)∩A(Ni)	Level
1*	1,	1, 12,	1,	6
2*	2,	1, 2, 12,	2,	5
3	3, 5, 7, 9, 10,	1, 2, 3, 5, 7, 9, 10, 12,	3, 5, 7, 9, 10,	4
4	4,	1, 2, 3, 4, 5, 7, 9, 10, 12,	4,	1
5	3, 5, 7, 9, 10,	1, 2, 3, 5, 7, 9, 10, 12,	3, 5, 7, 9, 10,	4
6	6,	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12,	6,	1
7	3, 5, 7, 9, 10,	1, 2, 3, 5, 7, 9, 10, 12,	3, 5, 7, 9, 10,	4
8	8,	1, 2, 3, 5, 7, 8, 9, 10, 12,	8,	3
9	3, 5, 7, 9, 10,	1, 2, 3, 5, 7, 9, 10, 12,	3, 5, 7, 9, 10,	4
10	3, 5, 7, 9, 10,	1, 2, 3, 5, 7, 9, 10, 12,	3, 5, 7, 9, 10,	4
11	11,	1, 2, 3, 5, 7, 8, 9, 10, 11, 12,	11,	2
12*	12,	12,	12,	7

Table 8. Canonical Matrix (CM) for ranking the factors

Variables	4	6	11	8	3	5	7	9	10	2	1	12	Driving Power	Level
4	1	0	0	0	0	0	0	0	0	0	0	0	1	1
6	0	1	0	0	0	0	0	0	0	0	0	0	1	1
11	0	1	1	0	0	0	0	0	0	0	0	0	2	2
8	0	1	1	1	0	0	0	0	0	0	0	0	3	3
3	1*	1*	1*	1*	1	1*	1	1	1	0	0	0	9	4
5	1	1*	1*	1	1	1	1	1	1*	0	0	0	9	4
7	1*	1	1*	1	1*	1	1	1*	1*	0	0	0	9	4
9	1	1*	1*	1	1*	1*	1	1	1*	0	0	0	9	4
10	1*	1*	1*	1*	1*	1*	1*	1	1	0	0	0	9	4
2	1*	1*	1	1*	1	1	1*	1	1*	1	0	0	10	5
1	1	1	1	1	1	1	1	1	1	1	1	0	11	6
12	1	1*	1*	1*	1	1*	1*	1	1	1*	1	1	12	7
Dependence Power	9	11	10	9	8	8	8	8	8	3	2	1		
Level	1	1	2	3	4	4	4	4	4	5	6	7		

facilitating a logical progression in problem-solving. The methodology prioritizes foundational, highly influential (bottom-level) factors first, gradually progressing toward dependent (top-level) elements. This systematic approach ensures that core issues are addressed before tackling higher-order dependencies, leading to a more efficient and strategic resolution of complex problems.

4.5 Canonical Matrix (CM) and Digraph

Based upon partitioning, further canonical matrix 'Directed graph (Digraph)' was developed. The final reachability matrix was used to draw a graph (Digraph) to visually represent hierarchical relationships. Digraphs is plotted with the help of ISM software tool.

4.6 MICMAC Analysis

To the extension of ISM analysis, MICMAC analysis is

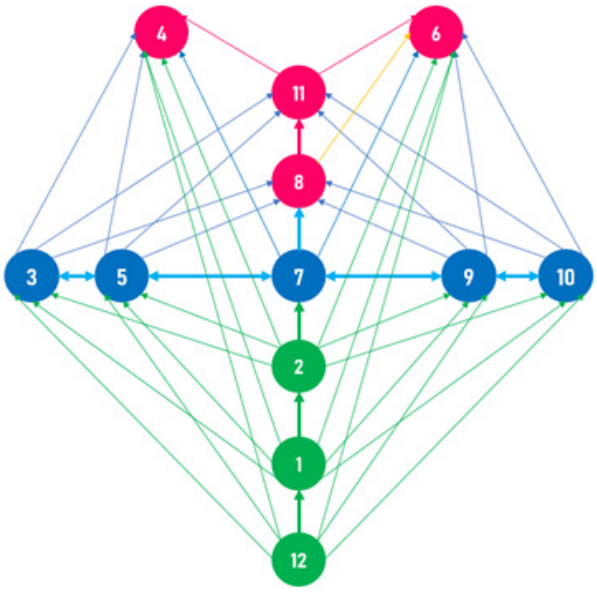


Figure 3. Digraph of value centric prerequisite factors.

established using driving and dependence powers as indicated in final reachability matrix. This gives us four clear categories:

4.6.1 Autonomous Variables: (Low Driving Power, Low Dependence)

Weakly connected with the system. Have minimal influence on other elements and are not significantly influenced themselves.

4.6.2 Dependent Variables: (Low Driving Power, High Dependence)

Strongly influenced by other elements. Do not significantly influence other elements.

4.6.3 Linkage Variables: (High Driving Power, High Dependence)

These are unstable variables since they are both influenced by others and strongly influence other elements. Any change in these variables affects multiple factors in the system.

4.6.4 Driving Variables: (High Driving Power, Low Dependence)

Key independent factors that drive the system. Managing these variables can improve system performance.

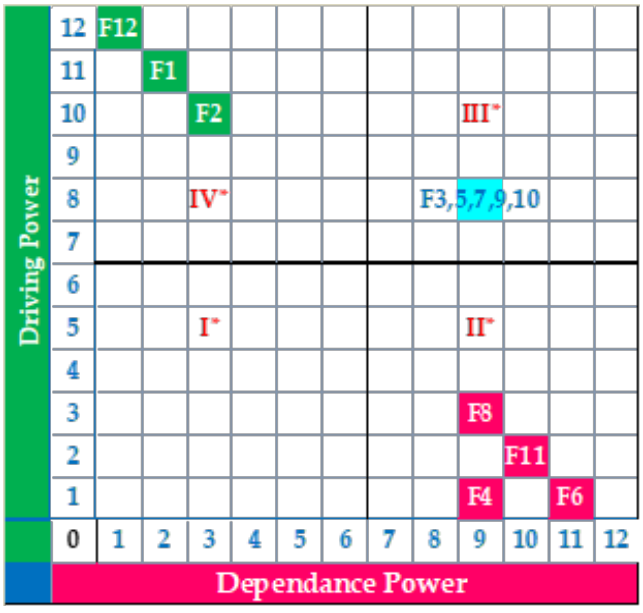


Figure 4. MICMAC analysis for identifying nature of factors.

These are indicated in the figure below as: I - Autonomous factors, II - Dependent factors, III - Linkages factors, IV - Independent variables.

5.0 Discussion

5.1 Structural Model of Value Centric Organiational Factors

The refined digraph is converted into an Interpretive Structural Model (ISM), which provides a structured visualization of relationships of 12 factors of value centric organisaiton. With the above analysis, a structure model of 12 factors to indicate interrelation, dependencies and significance of these factors was developed.

The Factors (1) Value-centric strategic approach (F1), (2) Monetising value capture (F12), and (3) Integration of projects to organisation (F2) have strong driver with low dependence, indicating it initiates significant interlinkages . These are very important and related to the leadership of value-centric organisations because they are the core enabler for the system and are essential drivers and should be prioritized in decision-making or strategic planning.

The factors at Level 4, those are, (1) Linking project to strategic value (F3), (2) Value process integration (F5), (3) Common forum for structured knowledge sharing (F7), (4) Innovation and experimentation (F10), and (5) Knowledge harvesting (F9) are strong intermediaries with significant influence and dependence. These play a crucial role in connecting the strategic and operational parameters, which are tactical in nature.

Higher-level factors (L1, 2, 3) like (1) Auto transfer of value (F4), (2) Engaging external etakeholders (F1), (3) Front-end stakeholders engagement (F8), and the (4) Evolving role of project panager (F11) are highly dependent and have low driving power, making it a dependent variable. They depend a lot on how committed management is to strategic factors. This is because these factors will be influenced by strategic and, to some extent, tactical parameters. This set of factors does not have any autonomous variable, and this is the best part: All variables are correlated with each other with the virtue of the management system.

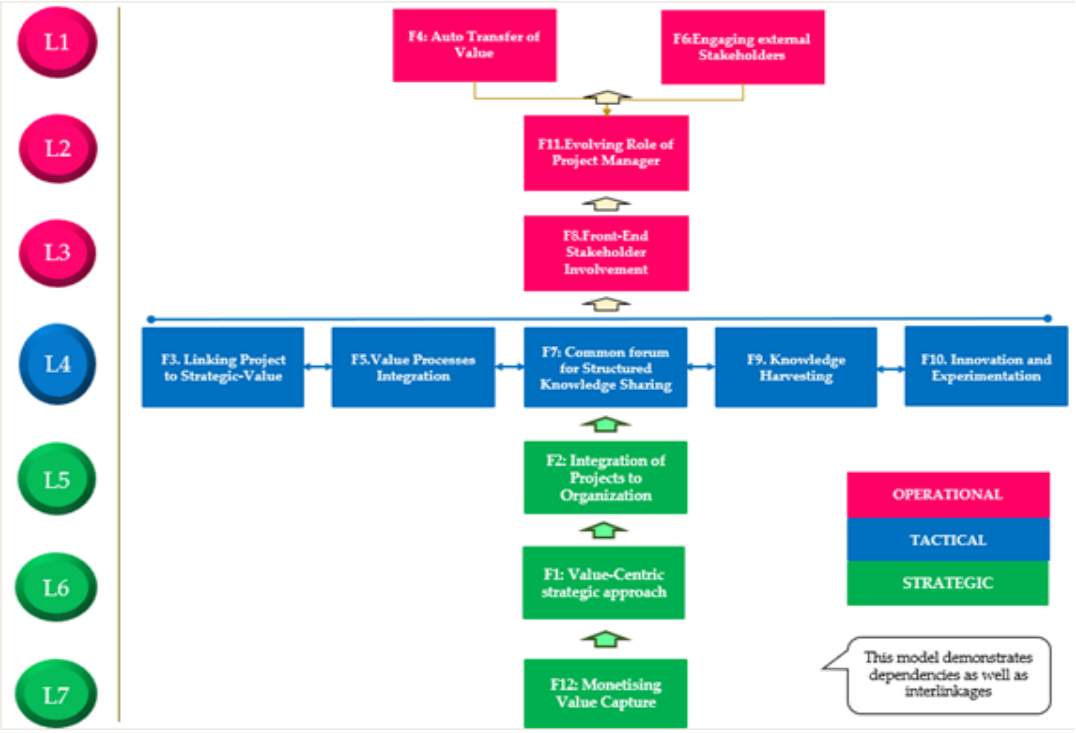


Figure 5. Structural framework of prerequisites for value centric factors.

5.2 Validation

These 12 factors are verified for acceptance by practitioner's acceptance and acknowledgement (Refer Section 3.2). When we compared the empirical survey analysis from

Table 9. Blending ISM, MICMAC and empirical analysis

Variable No	Variables	Rank of Significance with Empirical Feedback	Level and Significance by ISM and MICMAC	
F12	Monetising value capture	1	7	Strategic
F1	Value-centric strategic approach	2	6	
F2	Integration of projects to organization	3	5	
F7	Common forum for structured knowledge sharing	4	4	Tactical
F9	Knowledge harvesting	5	4	
F10	Innovation and experimentation	6	4	
F3	Linking project to strategic-value	7	4	
F5	Value processes integration	8	4	
F8	Front-end stakeholder involvement	9	3	Operational
F11*	Evolving role of project manager	11	2	
F6*	Engaging external stakeholders	10	1	
F4	Auto transfer of value	12	1	

* For F11, F6, rank and level do not match. This is subtle difference in both analyses. Being in operational region, the driving power of these variables is nominal and hence this will not have drastic impact.

Table 3 to the levels of elements in ISM analysis in Table 9, these were found in closed alignment. This indicates the validity of the ISM model for its reliability and implementation in empirical settings.

6.0 Conclusion

In conclusion, this study identified 12 key factors crucial for value-centric project management within manufacturing organizations and developed a structural framework using Interpretive Structural Modeling (ISM), opening up new avenues for further research and discussion. Supported by a robust theoretical foundation established through an extensive literature review, this framework has been validated by industry practitioners for practical applicability in empirical contexts. The research highlights the importance of capturing and converting project value into organizational benefits by strategically integrating short-term projects within long-term organizational strategies. The proposed framework emphasizes the necessity of establishing structured platforms for knowledge exchange with stakeholders and leveraging harvested knowledge to align project outcomes strategically. This work enriches the field of project management, promoting collaboration between researchers and practitioners in applying research insights effectively within manufacturing projects. Future research could further refine this framework by exploring the development of integrated systems and processes during project execution, ensuring continuous improvement through evolving concepts of value management and the incorporation of independent theoretical perspectives.

7.0 Author Contributions

Conceptualization and Supervision- SP; Methodology and ISM analysis- SP, SM. Empirical investigation, validation- SP and SS R.D.; Writing original draft preparation- SP and B.P. All authors have read and agreed to the published version of the manuscript.

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