

A Systematic Literature Review of Systems Integration and Management in Project Networks

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Abstract – The paper evaluates the shifts in the academic discourse in the context of integration over the last two decades within project networks. To achieve our research objectives, we focus on inter-organizational project networks using a meta-analysis approach that provides a rigorous systematic review of published scientific literatures. We analyzed articles from 4 leading project management journals 81 publications in IJPM, 11 in PMJ, 5 in IJPOM, and 20 in IJMPB. An initial search involved 115 peer-reviewed articles that were published between 2000 and 2020, and 56 were selected for the review after applying the inclusion criteria. The study identified a number of integrating mechanisms in project networks such as supplier integration, integration governance, process and knowledge integration, relational integration, contractual integration, team integration, and system integration. The findings also highlighted different types of integration strategies and views on integration, as well as, the role and significance of social and technical integration to support project success. The study also recognized areas that require further study, including reviewing more accurate information on how integration strategies can be practically implemented and how this integration affects project success.

Keywords – Integration, Project Networks, Contractual Integration, Inter-Organizational, Relational Integration, Project Management, Integration Governance, Process Integration, Supplier Integration, Knowledge Integration, Systems Integration.

I. INTRODUCTION

Recent studies in project management [1,2] have revealed that projects and project management are not only tools for coordinating minor tasks, but are also key competencies for any organization strategically. These studies have led to the creation of a brand-new field of study to cover the management of many parallel projects that are aligned as multi-project programs. Multi-project programs are used to manage complex and often ambiguous large-scale organizational initiatives that cannot be contained within the traditional project management framework. Factors such as the scale, uncertainty, complexity, and pace of a project are believed to significantly influence execution method of these programs [3]. The factors are similar to the ones proposed in classical contingency theory, where different ways of project management are attributed to complexity, uncertainty, and size [4]. Consequently, project management researchers are beginning to adopt a similar approach to better characterize project networks.

Project networks are defined as dynamic collections of project-based inter-organizational and interpersonal relationships [5]. The main focus for scholars and practitioners is shifting towards value creation rather than just product creation [6]. The provider's objective is not to solely provide value for the client, but rather to collaboratively generate value with the customer. Some researchers have proposed that the creation of value in project networks does not come from one-on-one interactions, but rather from activities at multiple levels (individual, team, and organizational) within relationships involving all actors in the network [7]. This viewpoint is currently in its early stages of development. When examining the network aspect of projects, many studies have primarily concentrated on the positive elements of relationships, such as trust, commitment, and collaboration, and how they contribute to creating value. However, there has been limited research on the consequences and handling of potential risks, conflicts, and stress, which can undermine relationships and lead to their breakdown. While numerous studies [8] have investigated value and conflicts individually, there is a scarcity of study on the connections between these concepts. There is a lack of a clear and inclusive framework that explains the theoretical and practical consequences of these connections in project research.

Specialized knowledge that participants bring to the project is a crucial component of project networks. Knowledge is a valuable asset for both independent enterprises and individuals within networks. The collaborative generation of value can help overcome deficiencies in skills and limited availability of resources among individual participants. Despite these

advantages, the network model nevertheless faces obstacles. The obstacles arise from the members' diverse and fragmented knowledge bases, as well as the transient character of project networks [9]. The work conducted within a project network is of a temporary nature, as it is particular to the project at hand. It has pre-established start and end dates, and the network would discontinue once the project is completed. A comprehensive literature search has found that although there are numerous studies on knowledge sharing within projects and project networks, these studies have not investigated the identification and integration of knowledge from various sources in project networks [10]. According to Revellino et al. [11], research on knowledge identification is still in its early phases, despite the fact that there has been a lot of study on knowledge utilization and less on knowledge acquisition. Additionally, the literature search revealed that information about knowledge identification and incorporation in project systems operating in big newly developing countries like India is not publicly accessible.

The goal of this study is to present a thorough analysis of the current body of knowledge in the integration of inter-organizational project networks. Coordination is an important part of project management that deals with the interconnection of various aspects of a project. However, there is a lack of a systematic literature review concerning how integration has been discussed and implemented in research, especially in project networks. This study seeks to address this issue by inspecting how integration has been defined, practiced, and assessed over the last two decades. With the help of the qualitative content analysis and systematic literature review, the study aims to contribute to the discussion of best practices in integration and uncover future research opportunities. The subsequent sections of this article have been arranged in the following manner: Section II reviews previous works related to integration, and temporary project networks. In Section III, the methodology employed in composing the research has been provided. It provides systematic literature review and qualitative content analysis, including article selection and analysis. Section IV provides a critical discussion of database search, formulation of a theoretical structure to incorporate cross-organizational project networks, integration governance, and qualified support for decision-making. Lastly, Section V draws a conclusion to the research recognizing fundamental areas for future research.

II. LITERATURE REVIEW

Integration

The term 'integration' is frequently associated with positive meanings; however, its definition remains ambiguous [12]. The development of inter-organizational integration is an ongoing process that occurs across professional boundaries and involves complex systems comprised of the participating organizations. Evaluating the success of integration is challenging [13]. Integration can be conceptualized as a spectrum that ranges from informal interactions at the lowest level to the establishment of a central authority responsible for making managerial and operational decisions at the highest level. Organisational integration is a well-established idea in the field of management, as noted by Audrin, Davoine, and Pichault [14] and Zhang et al. [15]. The origins of coordination, mostly in the setting of project organization methods, may be traced back to the 1940s. During this time, the demands of the Cold War and World War II necessitated more comprehensive efforts in integrating and managing projects than ever before [16]. Integration theorists who arose in the 1960s and early 1970s were primarily concerned with the management of large projects, organizations, and systems. Notable figures in this field include [17].

Integration management is a component of the PMBOK® knowledge domains, as defined by the Project Management Institute in 2013. When considering the knowledge fields, there are numerous situations that may be taken into account for structuring the processes of success management in the PMBOK's integration model. The first approach entails establishing success management as a novel field of knowledge, as suggested by Varajão et al. [18] and Heising [19], referred to as "Success Management" or a similar designation such as "Benefits Management". The second approach involves incorporating success management processes into the knowledge area of "Integration", given that integration management cuts across all other knowledge areas, similar to success management. The primary benefit of the first scenario (achieving success as a new field of study) is that it brings success management to the same level of importance as other areas of expertise. Essentially, this scenario highlights the significance of success management, placing it on par with other knowledge domains like as cost, quality, and risk management. Introducing a new field, such as "benefits management," can be a promising initial approach to achieving success.

Moreover, when faced with greater uncertainty, the organization must adapt by either reducing the volume of processed information or by taking actions that enhance its ability to handle information [20]. Coordination systems can be grouped into lateral and vertical approaches, such as horizontal integration, when it comes to the movement of data or the processing of information and knowledge. These two techniques improve the organization's information processing capabilities [21]. Since the 1980s, numerous empirical researches have endeavored to examine or implement contractual theories of integration. The research exhibit variations in the specifics, however they possess shared characteristics. The overall strategy involves forecasting observed integration decisions by utilizing transaction features described in the theory. Vertical integration involves the creation of unified procedures, whereas horizontal integration involves the establishment of integrative departments, cross-functional teams, liaison positions, and improved conveyance between units in meetings [22]. Vertical integration aims to provide channels that facilitate the upward flow of formalized and measurable data to the decision makers inside an organization. On the other hand, horizontal integration aims to decentralize the decision-making process within the organization.

Integration and Temporary Project Networks

Temporary organizations often depend on team structures, which consist of interdependent groups of individuals collaborating together [23]. Empirical studies regularly inspect project teams as collections of persons rather than organizational structures [24]. In interorganizational situations, individuals typically begin as a group with varied backgrounds, experiences, and expectations regarding the project objectives. They embody distinct (permanent) institutions with varying agendas and prerequisites. Assembling a cohesive team is therefore not obvious. In addition, project teams with a limited time-frame prefer to prioritize the current moment and direct their attention towards the activities that need to be completed. This results in heuristic information processing rather than methodical processing.

Temporary organization refers to a situation when competent individuals collaborate for a specific duration to accomplish a complex objective [25]. Instead of being contained within a single knowledge community, project participants are merged into a larger knowledge community, which serves as the primary network memory of the temporary labor practice [26]. The transitory work practice lacks the equivalent supporting structures and procedures seen in the permanent work practice. Consequently, this enhances the uniqueness of knowledge and prevents it from being inherently embedded in the organizational memory [27]. The emphasis on project objectives and tasks results in a predominantly localized form of learning [28].

III. METHODOLOGY

Our objective is to provide an inclusive outline of academic research on integration in inter-organizational project systems [29]. The study methodology used in this paper is a Systematic Literature Review (SLR) combined with Qualitative Content Analysis (QCA).

SLR and QCA

Systematic Literature Reviews (SLRs) [30] provide a methodology to compile scientific data to clearly and reproducibly answer a particular research question, with the goal of including all published material on the topic and assessing the quality of this evidence. SLRs are becoming a widely used methodology in domains such as health sciences and public policy research. Some advocates contend that this method should be used in design study. Aarseth et al. [31] and Svejvig et al. [32] outlines the essential stages for doing systematic and replicable literature reviews. Initially, it is crucial to find keywords that align with the goal of the review. Additionally, it is important to identify themes, publications, authors, titles, and study features. Furthermore, selecting the appropriate databases is necessary. Furthermore, rigorous investigations of superior quality are distinguished by establishing feasibility or practical criteria and employing procedural criteria for selection. Furthermore, it is essential to review recent works and collect information in a systematic fashion.

In addition, it is necessary to provide a report on the review process, including a clarification of how the validity and reliability of the review were determined. Additionally, it is necessary to provide clear explanations and valid reasons for the techniques employed in analyzing the data. Lastly, the results will be examined and documented [33]. Quantitative content analysis involves categorizing data using predetermined categories derived from a source other than the data being analyzed. This categorization is done automatically through an algorithmic search process, rather than by reading the data. The analysis is then conducted solely in a quantitative manner [34]. The categorized data lose most of their contextual information. To illustrate, a researcher aiming to analyze the usage of words like “die,” “dying,” or “death” compared to euphemisms like “pass away” or “demise” among physicians, patients, and family members would compile a word list. They would then employ a computer to search for these words in pertinent documents, such as audio-recordings of oncology outpatient visits, and employ statistical measures to compare their usage in each group.

The qualitative content analysis methodology requires following a consistent sequence of steps: formulating research questions, choosing material, creating a coding framework, dissecting the material into coding units, testing the coding framework, assessing and refining it, regulating the main study, and presenting and interpreting the results [35]. The coding frames can be established using either deductive or inductive approaches. Deductive approach involves deciding on the groups before developing the material, while inductive approach involves deciding on the categories after investigating the material. It is also possible to use a combination of both approaches [36]. The categories in this study were established using an inductive approach.

Sample Selection and Analysis

Systematic Reviews (SR) have the objective of determining all significant research that addresses a certain subject. Their purpose is to provide an inclusive and impartial outline of the current peer-reviewed works. The approach used to choose which studies to include in SRs are specifically intended to locate the negative research works, which may appear in low-impact conference proceedings or journals and are not published in bibliographic databases. The findings of the more easily found positive research works might be countered by these investigations. The research aimed to review published literature on integration within project networks. The analysis focused on journals in the sector of project administration, including the International Journal of Project Organization and Management (IJPOM), International Journal of Project Management (IJPM), International Journal of Managing Projects in Business (IJMPB), Project Management Journal (PMJ).

These peer-revised sources were selected for their high-effect and authenticated material on the integration methodologies used in project management discipline. We intentionally excluded field-specific journals from the analysis

in order to avoid delving too deeply into field-specific discussions. Instead, our aim was to acquire a broad overview of the discourse in the project organization domain. An information retrieval process was performed by employing the terms 'integration' and 'project' to search the database. The keywords listed above had to appear in the database entries' titles, abstracts, or keywords. Book chapters and other types of entries were not included because the entries that were included were just journal articles. The database search was restricted to the time span of this millennium, specifically publications published from 2000 to 2020. **Fig 1** depicts the circulation of the detected groups over the analyzed time period.

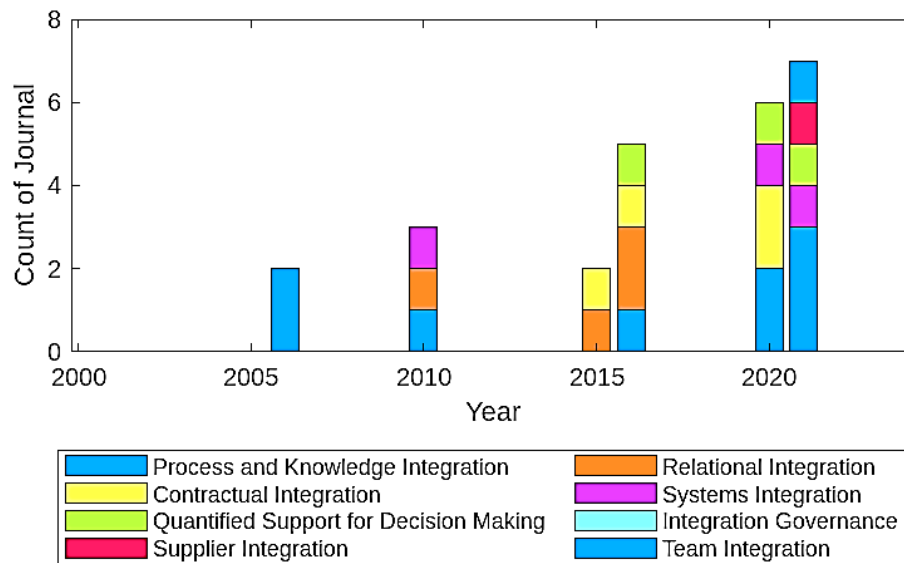


Fig 1. Articles Relevant to Groups of The Proposed Network Published Yearly

IV. RESULTS AND DISCUSSION

Database Search

The search utilized specific scientific databases such as Science Direct for IJPM, and Scopus for IJPOM, IJMPB, and PMJ. **Fig 2** displays the results of the initial searches, which revealed 81 publications in IJPM, 11 in PMJ, 5 in IJPOM, and 20 in IJMPB. These publications were transferred to NVivo program for additional subjective study. As part of the study, the initial aim was to determine whether the paper examined project systems. If the article did not address this topic, it was excluded from further examination.

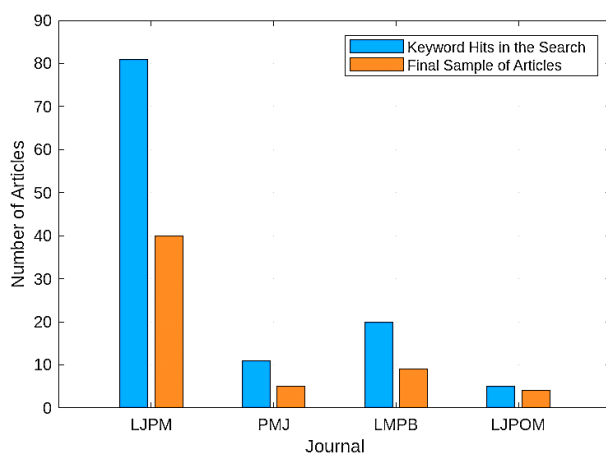


Fig 2. Keyword Hits and Final Sample of Articles

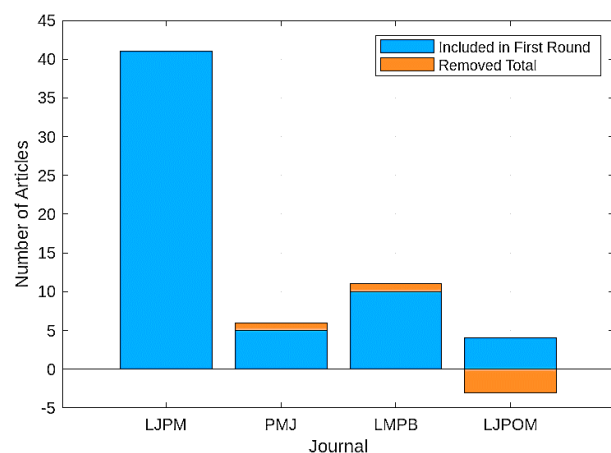


Fig 3. Articles Included and Removed

The investigation focused on thoroughly examining each article and its environment on the basis of project network and project mode. As a result, literature covering subjects like program management, project portfolio management, and intra-organizational integration were excluded from the research. The article was included in the study if the project mode was unclear. Literature reviews of high caliber rely on empirical facts derived from experiments and methodical observation. Consequently, subjective viewpoints such as editorials are deemed inappropriate for inclusion in the study [37]. As a result, conceptual papers and thesis report notes were excluded from the subsequent analysis. Thus, the initial analysis included a total of 41 publications from IJPM, 5 papers from PMJ, 10 articles from IJMPB, and 4 articles from IJPOM (refer to **Fig 3**). The investigation has discovered 117 papers that discuss integration within project networks. The details of these articles are

presented in **Table 1**. **Fig 2** and **Fig 4** shows the final selection of the publications. The articles that were excluded after the initial examination are shown in **Fig 5**.

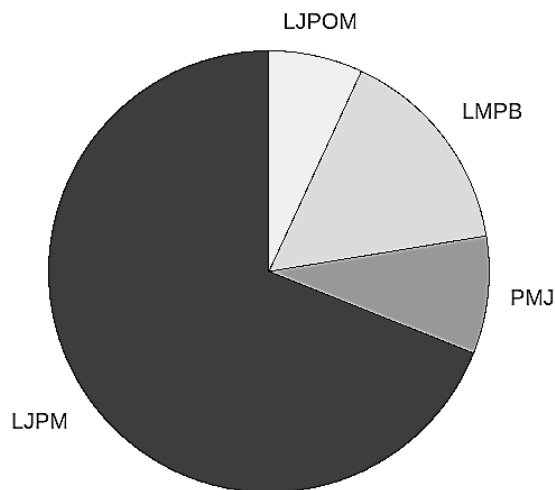


Fig 4. Final Sample of Articles

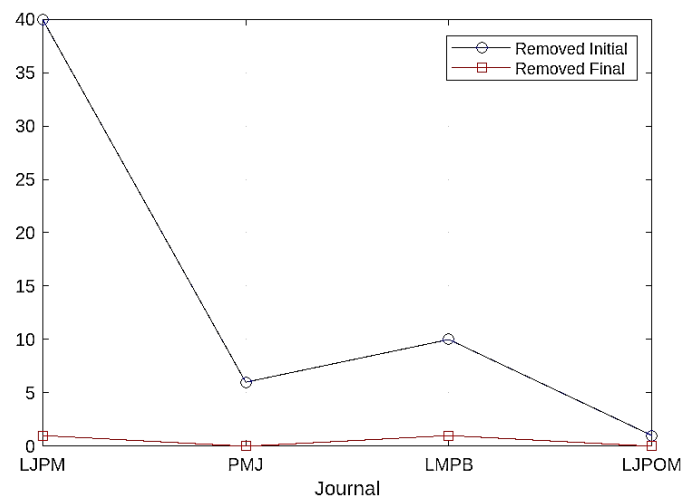


Fig 5. Articles Removed Over Each Analysis Phase

Table 1. Data on 117 Articles on Incorporation in The Setting of Project Systems Discovered in Our Investigation

Journal	Articles eliminated in accordance to initial analysis (Fig 5)	Hits of keywords in the search (Fig 2 and 6)	Sample of articles included in the first round of study (Fig 3)	Final samples of articles (Fig 4)	A final analysis led to the removal of further articles (Fig 5)
IJPOM	1	5	4	4	0
IMPB	10	20	10	9	1
PMJ	6	11	5	5	0
IJPM	40	81	41	40	1

Formulating a Theoretical Structure: Incorporation Within Cross-Organizational Project Networks

The architecture for project network incorporation was developed by analyzing the articles and using core theoretical concepts and ideas related to inter-organizational project networks as the basis for reasoning and categorization. High-quality assessments rely on empirical evidence derived from experiments and methodological observation.

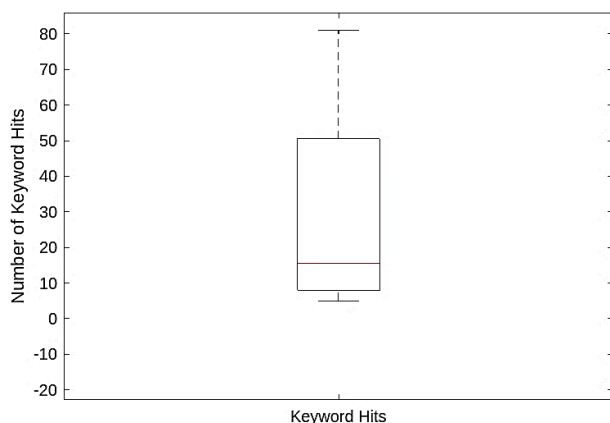


Fig 6. Keyword Hits

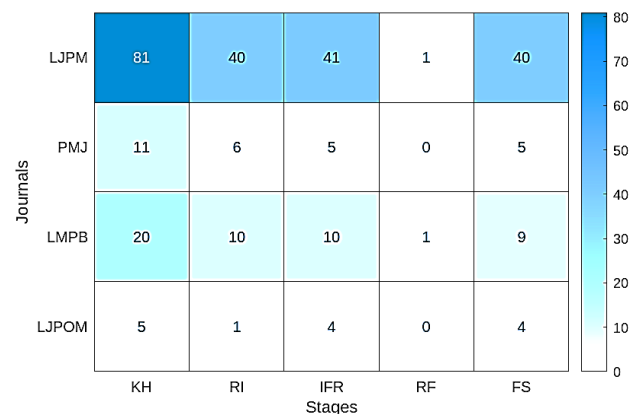


Fig 7. Article Selection Process

[**Abbreviations:** FS: Final Sample, RF: Removed Final, IFR: Included First Round, RI: Removed Initial, KH: Keyword Hits]

Therefore, subjective viewpoints, such as editorials, should be removed from the study [38]. As a result, theoretical papers and dissertation notes were excluded from further examination. Thus, the first sample of papers analyzed entailed of 41 articles in IJPM, 10 in IJMPB, 4 in IJPOM, and 5 in PMJ (refer to **Fig 6** and **Fig 7**).

Integration Governance

The publications we found that discuss different viewpoints on the management of integration include the studies conducted by Song et al. [39], Li et al. [40], Silvius et al. [41], and Brocke and Lippe [42]. The discovery that only four sources addressed the matter, each from different perspectives, was unexpected. Miković et al. [43] and Anglani et al. [44] proposed

a methodology for recognizing the social and technical dimensions of coordination in the project organization paradigm. Lopes and Flavell [45] and Wang et al. [46] suggested integration management components and assessed their impact on project management exhibition.

Integration management, as defined by Jaafari and Manivong [47] and Locatelli et al. [48], encompasses several key features like documentation, scheduling, configuration management, and costing and budgeting. These elements form the foundation of mechanisms engineering. Project incorporation facilitates the effective synchronization of project activities. Hence, it is crucial to have a comprehensive understanding of how integration management affects project success in order for project managers to leverage the advantages of effectively integrated project operations. Prior study has extensively shown the crucial importance of efficient incorporation in project management studies. The article discusses the management of integration in an inter-organizational entity, specifically focusing on how it is handled from the project phase to the operations phase. It identifies the integration mechanisms used during the project phase, which help in creating value during the operations phase. In addition, a study conducted by Hetemi et al. [49] and Malherbe [50] examined the adoption and adjustment of integration methods in an alliance project, shedding light on the dynamics of integration.

Contractual Integration

The 2 articles that address contractual integration are the studies conducted by Xia et al. [51] and Strain and Preece [52]. The study conducted an evaluation of two different models for organizing Public-Private Partnership (PPP) infrastructure projects and examined their distinct impacts on project management [53]. The study conducted by Liu, Clegg, and Pollack [54] and Keers and Van Fenema [55] examined the incorporation of project alliance principles into PPP initiatives. Significantly, both publications focused on PPP projects, whereas alternative perspectives connected to contracts or procurement were largely lacking in the analyzed sources.

Relational Integration

Relational integration emerged as a prominent area of research in our investigation. The references in this cluster explored the integration of behaviors, teamwork, and other relevant issues. Furthermore, the studies analyzed the integration of organizations in terms of behavioral and relational elements. The sources that examined relational integration include the studies conducted by Nikulina et al. [56] and Missonier and Loufrani-Fedida [57]. However, the researchers found that a collaborative procedure across different teams was crucial for enhancing the effectiveness of the project [58]. Interorganizational controls encompass strategies that facilitate the preparation and recognition of employees for their internal collaborations. These strategies also include surveillance mechanisms that monitor collaborations and establish criteria for determining when intervention is necessary during ongoing collaborations. The advantages of working collaboratively in a project setting are evident and extensively documented, as are the advantages of utilizing many tools to enhance cooperation. Contrary to the belief held by many professionals in the application development field, the construction business is not merely a part of the manufacturing sector.

The study conducted by Sanchez et al. [59] and Lee [60] found that the success of a project is highly affected by collaborative behaviors, including effective communication, alignment of interests, teamwork, trust, and equitable distribution of benefits and costs. Effective collaboration is built upon strong communication and cohesive teamwork. Effective information sharing and knowledge production rely on the establishment of strong relationships and efficient communication among project partners. This is especially accurate in a project environment characterized by a finite duration, when timely execution is essential for attaining project objectives. As the complexity of tasks increases, project management needs to provide not just more time, cooperation, and communication among project members, but also more instructions. Excessive resource allocation could result to significant details, which might increase the frequency of reminders before the completion of work as well as increased degree of discontent and stress.

In that regard, effective communication and strong relations is required to establish a productive working environment, which facilitates the accomplishment of required project objectives. Nevertheless, the majority of project frameworks, especially those in the field of sciences, do not adequately acknowledge and publicly tackle these concerns. Projects that recognize the importance of metacommunication, which refers to communication about communication, in promoting collaboration and organizational effectiveness, are primarily observed in the biomedical and public health sciences domains. In joint research endeavors, such as big research and training centers, there is a growing trend of incorporating individual measures, such as training in group procedures, communication, and conflict management.

Team Integration

Leal-Rodríguez et al. [61] and Musawir et al. [62] proposed that process and team integration is a crucial catalyst for the industry to achieve greater success. After the report, an Integration Toolkit was created to promote a unified approach by replacing the existing fragmented and contractual relationships with collaborative ways of working [63]. The construction industry has mostly concentrated its efforts on enhancing project procurement and product delivery procedures in order to promote team synergy [64]. Efforts have been made to integrate the construction project delivery team by implementing techniques and partnering arrangements that promote team building, collaborative working, and worker retention [65]. Procurement methods that integrate the design and construction phases of projects, like design and build, have also been implemented [66].

The sources that investigated integrated teams include the studies conducted by Zhang, Zhang, and Li [67] and Tabassi et al. [68]. The articles that addressed team coordination also included the topics of collaboration and knowledge coordination. Nevertheless, we chose to include team integration as a separate category in our study because it is a well-defined ideology and the publications provide a fundamental foundation for putting it into practice. The literature identified two critical factors that facilitate team integration: past relationships and shared experience. These factors enable the team members to create trust with each other [69]. Hobbs and Petit [70] and Lecoutre and Lièvre [71] identified twelve specific features of an integrated team and provided a clear definition of the fundamental elements involved in building such teams.

The literature on team integration was pragmatic, as it identified managerial approaches that led to complete or partial team fragmentation or integration [72]. The critical factors that determine the effectiveness of team integration in construction projects are identified as shared goals and a singular focus. Trust and respect among team members, and high levels of team integration are all essential success elements in building projects [73]. Furthermore, Wu, Wang, and Chen [74] have defined the framework for affecting the signals, which includes contractual model, team formation, operational monitoring, and collaboration concept. Nevertheless, Vaez-Alaei et al. [75] and Aloini et al. [76] emphasized the need for more investigation into the specific aspects that directly influence the success of integrated cooperation.

Yap et al. [77] and Sauer et al. [78] identified nine (9) important elements for an integrated IBS project. The purpose of this research was to collect data from various experts in the field of IBS (integrated building systems) from different disciplines. To do this, an industry workshop was chosen as the primary method to acquire and confirm all the essential components for successful integrated design teams. Kaiser, Arbi, and Ahlemann [79] assert that this strategy is the optimal and efficient method for gathering information, insight, experience, and expertise from a substantial number of industry participants within a brief timeframe. Another rationale for choosing this strategy is to tap into respondents' experiences and reactions in a manner that would not be practical with alternative methods such as observation, individual interviews, or non-verbal surveys. During the data collection stage, Workshop 1, which was an industry workshop, consisted of structured discussions among a diverse group of individuals from various backgrounds (such as designers, contractors, manufacturers, etc.). The purpose of this workshop was to gather detailed information about their perspectives and responses to the topic at hand.

Knowledge and Process Integration

The study publications that examined knowledge integration were authored by Lin et al. [80]. The research identified knowledge integration facilitators and activities [81], as well as explored how knowledge integration promotes learning in a project ecosystem. The effect of national context on project management integration was examined by Lehtimäki, Jokinen, and Pitkänen [82], while Huang and Newell [83] explored the impact of social capital on data integration. The sources that were identified as covering different perspectives on process integration include the works of Pollack et al. [84].

Process Integration refers to the utilization of methodologies created for system-integrated and oriented methods in the design of industrial process plants, whether for new constructions or retrofitting purposes. These methodologies encompass economic, mathematical, tools, and thermodynamic models, and methods. Some examples of these methodologies are Mathematical Programming, Artificial Intelligence (AI), Pinch Analysis, and Hierarchical Analysis. Process Integration encompasses the optimization of various design parameters, including as yields, capital investment, energy efficiency, safety, emissions, flexibility, operability, and controllability. Process Integration encompasses certain facets of operation and maintenance as well.

The literature analysis explored process integration from many angles. Three articles covered the topic of integrating IT systems with business processes. More specifically, they covered how to integrate IT systems with one another to improve support for business procedures and how to integrate software utilizations with partners in a business network and already-existing processes [85]. Kalkman and De Waard [86] examined the meaning of a uniform procedure and tools that help organizations manage the integration of their existing software applications. The study conducted by Momeni and Martinsuo [87] analyzed the integration and automation of work tasks inside and between projects. The findings revealed that higher levels of technology usage in projects were positively correlated with project outcomes. Kier et al. [88] proposed a systematic approach and organizational framework for effectively incorporating stakeholders into a project.

The authors introduce the initial concept of shareholder involvement aspects for process advancement projects, which is validated by empirical evidence. The framework was built by integrating empirical data from a comprehensive case study carried out at an Australian financial services provider with pertinent literature that employed Kassin's social psychology model as a conceptual perspective. Five levels make up the framework: "micro," "macro," "meso," "exo," and "chrono." These levels reflect several 'systems' that encompass a variety of aspects that impact stakeholder assignment in process advancement programs. Picciotto [89] and Pilbeam [90] offer a crucial point of reference for BPM practitioners in the design of stakeholder engagement and intervention programs, particularly in the development of enduring strategies for change that facilitate effective outcomes.

Supplier Integration

Supplier integration is defined by Martinsuo and Ahola [91], Ahola, Vuori, and Viitamo [92] and Dwicahyani et al. [93] as a condition of syncretism between the supplier, purchasing, and production components of a company. Several studies have explored the theme of integration in the setting of supply chain coordination [94]. The study has examined the incorporation

of product and process design decisions made collaboratively by suppliers and enterprises in the supply chain. This analysis has been conducted from multiple theoretical viewpoints, such as network governance models, transaction cost reductions, organizational design, and relational theory. These theories demonstrate that successful supplier alliance within the company-supplier spectrum necessitates the implementation of suitable protections and coordinating mechanisms. Supplier integration is differentiated from the broader notion of supply chain integration [95] by its major emphasis on integrating inside the organization and its source base.

The works of Ali and Haapasalo [96] were selected as references that primarily focused on supplier integration. While the papers were classified under supplier integration, the sources mostly emphasized perspectives on horizontal alliance, and hence did not provide detailed information on traditional supply chain incorporation. Supplier integration refers to the collaborative and controlled relationship among the supplier and project contractor during the performance of a project [97]. Proposed managerial solutions for achieving upstream functional integration include resource distribution, collaborative issue resolution, and collaborative structures such as alliances [98] advocated for a more contemplative approach to project management and supply chain management in order to construct a unified supply chain. According to Fernandez et al. [99], past research has found that the activities aimed at integrating suppliers vary significantly across different studies. Our data also supports this conclusion.

Systems Integration

Saukko et al. [100] and Brones et al. [101] define systems integration as the consolidation of a company's data mechanisms and databases to enhance process flow and prioritize client services. Essentially, the integration of systems ensures the coherence of existing systems, facilitating the seamless flow of business operations and the presentation of information in a unified manner. This, in turn, aids in supporting administrative and management decision-making. According to Martinsuo, Vuorinen, and Killen [102], the integration of business applications is considered an issue at the corporate level and requires a strategy at the same level. Agarchand and Laishram [103] states that integrated business systems, at most, fulfill around 70% of the requirements of an ordinary corporation. Technologies such as extranets, data warehouses, intranets, and enterprise resource planning (ERP) systems employ various methods to link processes with their associated information systems. In addition, it is important to note that while IS leaders are often recognized for successfully completing IS projects within the designated timeframe and budget, they are not typically acknowledged for ensuring that these systems can be seamlessly integrated with current applications. Therefore, it is imperative to prioritize the development of Enterprise Application Integration (EAI).

The sources we found that analyze strategic incorporation in intricate project systems included the publications by Liinamaa and Staadt [104]. In addition, there were just three publications specifically addressing this topic. The concept of systems integration, which serves as a framework and method for managing project intricacy, was elucidated in a specific article authored by Mainga [105]. The practical methods for integrating systems may differ, however there are some shared strategies for handling the complex structure and dynamics of large projects that have been found [106]. The study also explored the social aspect of mechanism incorporation and found that effectively identifying and addressing customer requirements as part of the incorporation process had a considerable beneficial influence on project success [107].

Measured Support for Decision-Making

The most distinct branch of peer-reviewed works we found was categorized as quantitative support for decision making. The cluster in question includes references that specifically address the provision of assessed support for determination. These references include the works of Badi and Pryke [108]. The sources analyzed various viewpoints on the upward movement of formalized and quantified data inside the organization, hence supplying assessed information to bolster the process of decision-making outlined by Princes and Said [109]. Enhancing project control mechanisms through the integration of data and knowledge was a significant focus in the literature [110].

During the initial stages of computers, information was processed on centralized systems. Consequently, processes and data coexisted in a uniform environment. Under these processing constraints, integrating applications typically required additional coding. With the advancement of technology, there were changes in platforms, leading to the emergence of new, smaller, and more open programmes like Windows NT and UNIX. In addition, emerging programming standards like component-based and object-oriented development, as well as the advent of packaged programs like enterprise resource planning (ERP) solutions [111], gained significant importance and popularity. Many organizations hastily adopted these new technologies without demonstrating foresight in selecting the appropriate design. IT decisions were decentralized, with individual departments autonomously selecting technologies and solutions according to their specific requirements and beliefs. Consequently, the entire organization was left with a set of mechanisms that were exceedingly challenging to combine. Although these knowledges still offer some benefits to the company, their value is reduced because they are unable to take advantage of other corporate applications.

Furthermore, Mohammadi [112] established a methodology for integrating information in electronic commerce applications. The study conducted by Benedetto, Bernardes, and Vieira [113] analyzed the incorporation of forecasting and project control systems. Additionally, the research by Tampio, Haapasalo, and Lehtinen [114] investigated the integration of scheduling and funding functions in project coordination. In addition, the study also scrutinized the measurement of project control efficiency [115]. The analysis focused on examining a method and a tool used to assess the level of system

integration [116]. Hartono proposed a model that quantifies project risks and their impact on cash flow predictions. Moreover, a single source was used to develop a diagnosis and prediction model that facilitates decision making in structure projects.

V. CONCLUSION

This paper adopts a SLR and QCA approach to explore the integration concept in inter-organizational project networks in the past two decades. This paper aims at discussing the future of integration based on the data acquired from the analysis of 115 articles. This study reveals that integration in project networks is a multifaceted concept that involves systems integration, supplier integration, integration management, integration of knowledge and processes, contractual and team integration, integration governance, and relational integration. These themes focus on the aspect of integration as a sociotechnical process which includes social and technical enablers for co-ordination of the project. Integration governance implies that, there are policies and architectures in place for integration. Contractual integration focused on contracting and legal relationship and public private partnership as the dominant form of integration. Relational integration emphasized on communication, interpersonal relations, and trust between the members of a project, and on the other hand, team integration focused on the efficiency and coordination of the members and teams to which they belong. The two combined factors, i.e. process and knowledge integration, were also found to support changes to enhance innovation and efficiency, specifically with integration of IT systems and knowledge management. Lastly, supplier integration emphasized the relationships and coordination between contractors and suppliers while systems integration focused on the incorporation of information systems for better business processes and decision-making.

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The author reviewed the results and approved the final version of the manuscript.

Data Availability

No data was used to support this study.

Conflicts of Interests

The author declares that they have no conflicts of interest.

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