
Inter-organisational project network integration: a systematic literature review

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Abstract: The purpose of this paper is to achieve an understanding of integration in inter-organisational project networks. This paper encapsulates scattered research streams concentrating on integration and adds to the perspectives of integration studies towards inter-organisational project network landscapes. The adopted research method is a systematic literature review through a qualitative content analysis, which provides a conceptual framework on integration in project networks. The framework includes eight concepts of integration in project networks. The developed framework improves understanding of how academic literature examines and comprehends integration in inter-organisational project networks. Furthermore, this paper shows that the research area is emerging and has until now focused mainly on construction and infrastructure sectors in the project management literature. The findings highlight consistent streams of discussion, gaps in knowledge, and propose a need for further research. There are a limited number of efforts towards creating a comprehensive understanding of how integration is presented and takes place in practice in complex project networks. This paper points out collaborative practices as the centre of academic attention. In addition, it reveals a scarce attention on exhaustive themes such as integration governance. This study creates a framework and common language for further use for academics and practitioners.

Keywords: integration; project network; inter-organisational project.

1 Introduction

Projects that bring together various firms and organisational units are a highly pervasive and increasingly important organisational phenomenon (Lighthart et al., 2016; Manning, 2017; Turkulainen et al., 2013). The role of such projects can be assumed to grow in the context of modern project management, since the importance of project network organisations is increasing in comparison to project-based firms (Manning, 2017). Furthermore, the nature of projects has changed, including ever more knowledge bases, technologies, and subsystems (Wikström et al., 2010). Several authors have called for new perspectives on how project networks are developed and managed in project business (Wikström et al., 2010). By definition, project networks are constituted of legally independent but operationally interdependent organisations and individuals, in strategically coordinated sets of teams and partner pools, sustaining beyond singular projects (Manning, 2017).

Project cooperation and coordination processes are highly complex when involving many technologies and individual organisations, partners, and suppliers (Browning et al., 2006; Wikström et al., 2010), coordination being vitally important in project networks (Hellgren and Stjernberg, 1995). The concept of project integration can be defined as the required process of ensuring that the various activities within a project are properly coordinated (Kirsila et al., 2007). Therefore, the need for integration in project networks is expected to be notable. However, previous research has overlooked the integration mechanisms of project networks (Bechky, 2006; Lumineau and Oliveira, 2018; Oliveira and Lumineau, 2017). Furthermore, integration-related perspectives in project management research appear to have been minimal up to now, and there is a clear need for more of such intake (Padalkar and Gopinath, 2016). Moreover, integration literature tradition (Galbraith, 1974; Lawrence and Lorsch, 1967) derives from manufacturing or production organisations, and the original integration theories focus on intra-organisational settings (Bechky, 2006; Hietajärvi et al., 2017). As will be elaborated in this study, integration in project networks has indeed gained more attention only recently in the field of project management, probably due to the changing temporary organisations landscape and growing need for coordination within. However, the project management literature covering the subject is multifaceted, suffering a lack of focus, and

there is a clear need for summarisation. Hence, in this paper we seek an improved understanding of which are the key perspectives, current emphasis, and potential gaps in integration of these rising forms of organisations.

This paper is guided by the following research question:

RQ How has integration been studied in the context of project networks in the academic project management literature during the past decades?

Project management domain was chosen specifically as the centre of attention, since the main purpose was to elaborate how the concept of integration is demonstrated in a rising field of interest: inter-organisational projects and project networks. Through a systematic literature review and a qualitative content analysis, we identify streams of discussion and develop a conceptual framework for integration in project networks. The identified streams of literature and the gaps within have the ability to guide the development of further theoretical and managerial perspectives. This paper contributes theoretically to the academic discussions related to integration and coordination, project networks, temporary organisations, project management, and collaboration.

The paper is structured as follows. First, the theoretical background of the subject is elaborated. Second, the research methodology and research process are presented. Thereafter, the results of a systematic literature review and answer to the research question are presented. Furthermore, a framework developed based on the analysis is presented. Finally, the achieved results based on the literature review are discussed, conclusions made and limitations of the study expressed. Also, avenues for further research are suggested.

2 Theoretical background

2.1 Integration

Organisational integration is one of the most established concepts in the study and practice of management (Turkulainen and Ketokivi, 2012). The history of integration, especially systems integration, in project management practices dates back to the 1940s and a time when WWII and Cold War projects required more extensive integrative and management efforts than ever before (Johnson, 2013). Early integration theorists emerged in the 1960s and early 1970s, focusing on how large projects, organisations, and systems ought to be managed (Galbraith, 1974; Lawrence and Lorsch, 1967; Söderlund, 2012). Practical integration studies, such as via examining the factors and the managerial mechanisms affecting integration and the barriers to integration (Mitropoulos and Tatum, 2000), or via elaborating organisational integration management through impersonal, personal, or group modes (Turkulainen et al., 2015), were introduced later on.

Integration has a central place in several domains such as general management, strategy, organisational theory, operations management, and information systems (Barki and Pinsonneault, 2005). Integration management is also one of the ten PMBOK® knowledge areas (Project Management Institute, 2013). During the past decades, integration has received academic interest in the contexts of general management of multinational enterprises, of operations and supply chains, and of megaprojects, for example (Teerikangas and Geraldi, 2015). However, it is notable that the academic

discussion over the phenomenon has developed in silos, in somewhat independent streams (Teerikangas and Gernaldi, 2015).

One theoretical viewpoint on integration is to define it as sharing and processing information (Turkulainen et al., 2013). According to the integration literature basics, the greater the task uncertainty, the greater the amount of information processed during the task execution (Galbraith, 1974). Furthermore, as uncertainty increases, the organisation must respond to it by either decreasing the amount of processed information or by acting in a way that increases the capability to process information (Galbraith, 1974). When approaching integration as an information flow or as a flow of processing information and knowledge, integration mechanisms can be divided, amongst others, into vertical and lateral, e.g., horizontal integration; both integrative methods increase the organisation's capability to process information (Galbraith, 1974; Turkulainen et al., 2013). Whereas creating unified processes is an example of vertical integration, horizontal integration refers to creating cross-functional teams, integrative departments, liaison roles, and increasing communication across units in meetings (Turkulainen et al., 2013). The goal of vertical integration is to create channels that move formalised and quantifiable data upwards to the organisation's decision makers, whereas the goal of horizontal integration is to move the level of decision making down in the organisation (Galbraith, 1974).

Another approach to integration is to define organisational integration either as the extent to which distinct and interdependent organisational components constitute a unified whole (Barki and Pinsonneault, 2005) or as the process to achieve unity of effort amongst the various subsystems (Lawrence and Lorsch, 1967). Whereas the perspective on integration is as a strategic objective, the achieved integration refers to the consensus across functions (Turkulainen and Ketokivi, 2012). Extensions to the organisational integration are the factors of human aspects and knowledge aspects; human aspects being essential due to the increasing collaboration of individuals, and knowledge aspects being required since the integration is facilitated by communication and knowledge sharing (Barki and Pinsonneault, 2005). Furthermore, notably even the early integration theorists had the notion that in this context organisational boundaries do not necessarily follow the respective legal boundaries (Lawrence and Lorsch, 1967), meaning integrative activities occur inter-organisationally.

Whereas the early integration theories were developed in an intra-organisational setting of manufacturing companies, it is noteworthy that those theories do not fully capture the various dynamic aspects of the modern project network landscapes (Hietajärvi et al., 2017). Integration taking place across company boundaries is presented by establishing and using coordinating structures, technologies, processes, and practices in order to collaboratively support and manage the flows of information, goods, and services (Ahola et al., 2017). Furthermore, the academic stream of studying integration in the context of inter-organisational megaprojects has focused on analysing the ways in which integrative practices can help the participating organisations work more effectively together (Teerikangas and Gernaldi, 2015).

2.2 Integration and temporary project networks

Temporary organisation can be defined as a setting in which skilled people work together for a limited time period in order to perform a complex task (Bakker, 2010; Jacobsson et al., 2015). All projects are temporary organisations, but not all temporary organisations

are projects (Bakker, 2010; Jacobsson et al., 2015). Temporariness is a key characteristic of an inter-organisational project, where the lead organisations select partner organisations in a flexible and reconfigurable manner (Ligthart et al., 2016). However, despite the temporary nature of an individual project, a collaborative network based on prior relationships remains within the partner organisations over the individual projects (Ligthart et al., 2016). Altogether, project networks may be viewed as a single inter-organisational project or as series of projects linked together by inter-organisational relationships (DeFillippi and Sydow, 2016).

Traditionally projects have been considered as means to achieve specific targets by normative project management techniques and methods (Hellgren and Stjernberg, 1995). Furthermore, projects are processes of continuously redefining ends, and means to achieve them (Hellgren and Stjernberg, 1995). The latest developments indicate that the concept of projects should be analysed in relation to the end state – preferred, pursued, and actually achieved, with no predefined standard operating procedure (Lundin and Söderholm, 2013). Developing this idea further, it is suggested that the attention should be shifted from project management to project network management (Manning, 2017). Whereas complex solutions are typically produced by project networks, the success of the complex solutions delivery depends on the efficient functioning of the entire project network (Martinsuo and Ahola, 2010). How suppliers are integrated into the project network influences the success of the entire project (Martinsuo and Ahola, 2010).

Temporary project network organisations are governed through networks of relationships rather than lines of authority, thus integration relies heavily on social mechanisms (Bechky, 2006). Moreover, project management firms, i.e., systems integrators, and contracts have been identified as the key means to integrate project networks (Oliveira and Lumineau, 2017). Through systems integration, organisations cope with uncertainty by dividing their system into smaller components and managing and integrating the interdependencies between these components (Davies and Mackenzie, 2014). The most important face of systems integration nowadays are the activities through which components, skills, and knowledge produced by external organisations are integrated (Hobday et al., 2005). The complexity of the project can be defined by focusing on the project system's components, the variety and number of and the interdependencies between these components, and the hierarchical levels in the system (Davies and Mackenzie, 2014). Moreover, scaling up the traditional project contracts has had a small positive impact on megaproject delivery, but further research efforts have recently been called for (Jobling and Smith, 2018).

Project management research is focused on handling integration from two different viewpoints: first, through organisational integration and second, through technical, i.e., product and outcome related integration (Arto et al., 2016). Thereby, integration in a project context includes systems integration activities by integrating the work and capabilities of multiple suppliers in an organisational manner (Arto et al., 2016). Furthermore, in project context systems integration activities refer to integration activities in which products and services, provided by multiple suppliers, are integrated into the whole of a project, product, or solution (Arto et al., 2016; Davies and Mackenzie, 2014). Systems integration can be organised through a systems integrator, who organises and coordinates integration of various components (Davies et al., 2007). A systems integrator organisation can be organised as an in-house practice of a large and experienced client organisation, or, alternatively it can be organised as a temporary joint-venture

organisation (Teerikangas and Gerald, 2015). Altogether, systems integration is one of the key capabilities of modern companies (Hobday et al., 2005; Wikström et al., 2010).

3 Methodology

This study is an attempt to summarise how the academic stream focusing on integration has studied the phenomenon in project networks during the past decades. The unit of analysis is an inter-organisational project network. The research method is a systematic literature review using qualitative content analysis, thus no new empirical results are presented in this study.

3.1 Systematic literature review and qualitative content analysis

A systematic literature review must include three key concepts, whereas it is required to be systematic, explicit, and reproducible. The literature review is defined as systematic when examinations of the existing information are done systematically, describing and justifying what is done. In addition, explicit criteria for article selection must be stated (Fink, 1998).

According to Fink (1998), the following steps are crucial in systematic and reproducible literature reviews. First, identifying keywords based on the review's purpose, and identifying subjects, titles, authors, publications, and study characteristics, as well as selecting the databases, are essential. Second, high quality studies are identified by setting practical or feasibility criteria and selecting methodological criteria. Third, the literature must be read and data collected in a standardised manner. Fourth, the review process must be reported on, and an explanation given of how the reliability and validity of the review were established. Clarifying and justifying the methods used to interpret the data are also required. Finally, the findings are to be analysed and reported (Fink, 1998).

In qualitative content analysis it is essential to analyse all the material and decide for every part where in the coding frame it belongs to. Another essential part of the qualitative content analysis methodology is to involve the same sequence of steps every time: deciding on the research questions, selecting the material, building a coding frame, dividing the material into the units of coding, trying out the coding frame, evaluating and modifying the coding frame, conducting the main analysis, and interpreting and presenting the findings (Schreier, 2012).

The main categories and subcategories in the coding frames can be specified either deductively or inductively, meaning either in a manner deciding the categories before elaborating the material or in a manner deciding the categories after exploring the material, or both (Schreier, 2012). In this study the categories were developed in an inductive manner.

3.2 Sample selection and analysis

The systematic literature review was conducted as follows. Since the aim of the study was to review what has been published on integration in the context of project networks, the journals included in the analysis were the ones focusing on the field of project management: *International Journal of Project Management (IJPM)*, *Project Management Journal (PMJ)*, *International Journal of Managing Projects in Business*

(*IJMPB*) and *International Journal of Project Organisation and Management (IJPOM)*. These peer-reviewed sources were considered to provide high-impact, validated information on how project management discipline approaches integration. Field specific journals were deliberately delimited out of the study, since we did not want to go too deep on the field-specific discussion, but rather obtain a general view of the discourse in the project management domain.

A database search was conducted by using the keywords ‘integration’ and ‘project’. The abovementioned keywords were to appear in the title, abstract, or keywords of the database entries. Included entries were the journal articles, thus entries such as book chapters were excluded. The time period on the database search was limited to this millennium, i.e., the searched articles had been published between the years 2000–2017. The scientific databases used in the search were Scopus for *PMJ*, *IJMPB* and *IJPOM* and Science Direct for *IJPM*. The initial search yielded 81 articles in *IJPM*, 11 articles in *PMJ*, 20 articles in *IJMPB*, and five articles in *IJPOM*. The articles were exported into NVivo software for further qualitative analysis.

The first task during the analysis was to find out whether the article explored project networks – if not, the article in question was ruled out from further study. Each article and its context were carefully examined in terms of project and project network mode, in which the analysis focused. Thereby, the articles concerning, for example, intra-organisational integration, integration in project portfolio management, and integration in program management were excluded from the analysis. If the project mode was not clear, the article was included in the analysis. High quality literature reviews base the findings on the evidence that results from experimentation and systematic observation, thus opinions such as editorials must be excluded from the study (Fink, 1998). Therefore, conceptual papers and thesis report notes were not included for further study. Thereby, the sample of articles analysed on the first round consisted of 41 articles in *IJPM*, five in *PMJ*, ten in *IJMPB* and four in *IJPOM*. The overview of the keyword search results and samples of analysed articles is presented in Table 1.

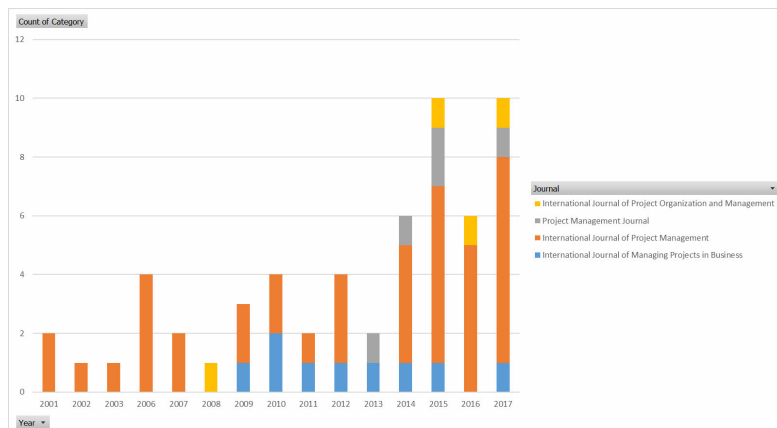
Table 1 Details of 117 articles covering integration in the context of project networks identified in our study

<i>Journal</i>	<i>Keyword hits in the search</i>	<i>Articles removed based on initial analysis</i>	<i>Sample of articles included in the first round of analysis</i>	<i>Additional articles removed based on final analysis</i>	<i>Final sample of articles</i>
<i>IJPM</i>	81	40	41	1	40
<i>PMJ</i>	11	6	5	0	5
<i>IJMPB</i>	20	10	10	1	9
<i>IJPOM</i>	5	1	4	0	4

The first round of analysis of the sample of articles proceeded as follows. All the mentions of integration within the articles were coded in NVivo in terms of which take on integration the mention in question had when compared to larger streams on integration literature. Therefore, a single article was often coded under several categories, depending on how many mentions of, and takes on, integration the article in question had. The initial coding resulted in 104 categories, and the sample of 60 articles was linked into these categories 268 times. Different concepts of integration appeared in the articles altogether 889 times, and were coded under the 104 initial categories.

During the second round of analysis, the main theoretical approach and perspective to integration was identified for each article and coded equivalently. The identification was done based on the initial coding and thoroughly examining the texts. Categories were combined on common themes, and as a result the number of categories could be reduced to eight main categories that each has a distinctive theme. These main categories summarise the main and primary perspective on integration each paper had, even though each paper had multiple angles on the subject, as the initial coding revealed. The criteria used for dividing the articles into the aggregate main categories and sub-categories were the dominating and shared common themes across each article. The categorisation process was also guided and supported by fundamental approaches and theoretical ideas concerning project networks (Browning et al., 2006; DeFillippi and Sydow, 2016; Galbraith, 1974; Ramasesh and Browning, 2014), discussed in more detail in section 4.1. During the second round of analysis, two papers were additionally excluded from the final sample of the analysed articles. Figure 1 presents how the final sample of articles is divided amongst the four journals: *PMJ*, *IJPM*, *IJOMP* and *IJMPOM*. Figure 1 also shows the growing interest in the subject from 2010 up to 2017.

Figure 1 Articles discussing integration in project networks, published annually in the selected journals (see online version for colours)



Finally, a framework was developed based on the final coding generated during the second round of analysis. There are two ways of organising the qualitative research results, either by cases or by categories (Schreier, 2012). In this study the sources were classified into categories in order to build a conceptual framework, presented in detail in the next chapter. Since all the analysed articles had multiple viewpoints on integration in project networks, each article could have been classified in various ways and in most of the cases under several different classes. However, the decision about the classification was made based on the main theme in the article. Hence, the clusters and categories are partly overlapping. The complete research process is presented in Figure 2.

Figure 2 Research process (see online version for colours)

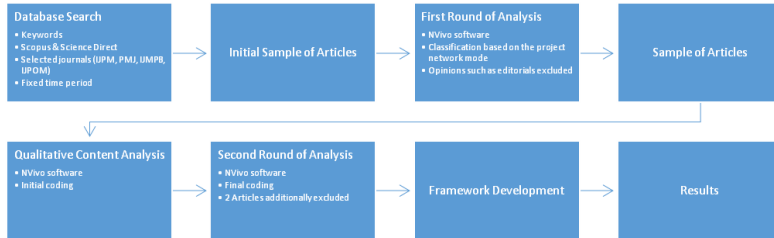


Figure 3 Empirical approach of the analysed articles (see online version for colours)

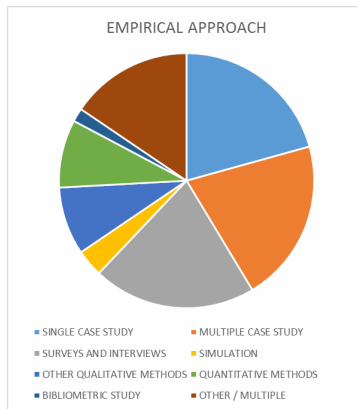
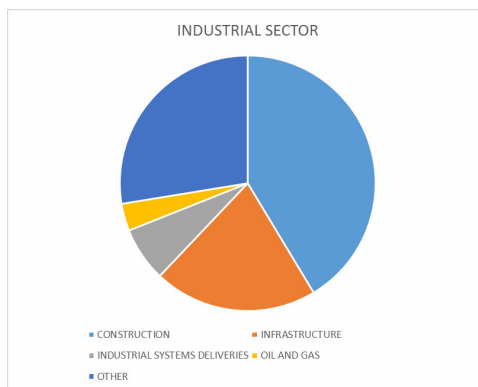


Figure 4 Industrial sector of the analysed articles (see online version for colours)



The empirical approach of the final sample of articles is presented in Figure 3. The majority of the articles used qualitative methods or case studies as the empirical data source and approach for analysis. Furthermore, the industrial sector of the final sample of articles is presented in Figure 4. Notably, the majority of the studies had focused on the construction or infrastructure sectors.

4 Results

4.1 *Developing a conceptual framework: integration in inter-organisational project networks*

When developing a framework of project network integration based on the content analysis of the articles fundamental theoretical notions and ideas with regard to inter-organisational project networks were utilised as starting points for the reasoning and in elaborating the categories. First, the notion of a project being dividable into five subsystems: product subsystem, process subsystem, organisation subsystem, goals subsystem, and tools subsystem (Browning et al., 2006; Ramasesh and Browning, 2014), was used as a theoretical starting point. This perspective's approach highlights the importance of integrating the identified separate subsystems and is visible in our separation of systems integration from process and knowledge and relational integration. Another starting point was the theoretical ideas of horizontal and vertical integration presented by Galbraith (1974), even though the original context is an intra-organisational setting. Particularly, the supplier integration and integration governance clusters resonate with this separation. Third theoretical starting point that guided our reasoning was the suggested classification of project network governance under responsibilities, routines, roles and relations (DeFillippi and Sydow, 2016). The perspective of governance and its classification is particularly explicit in our division of contractual integration, quantified support for decision making, integration governance and team integration. Following the abovementioned lines of reasoning as a theoretical foundation, the conceptual framework was outlined. Most of the articles could have been classified under several clusters in our framework, however, the most suitable one was chosen based on the theoretical approach and content that was dominant in each paper. The framework developed is presented in Table 2 and opened up in detail in the following chapters. The distribution of the identified clusters over the analysed time period is illustrated in Figure 5.

4.2 *Integration governance*

The articles our analysis identified examining various perspectives related to governance of integration were the works of Demirkesen and Ozorhon (2017), Kirsila et al. (2007), Hietajärvi et al. (2017) and Artto et al. (2016). It was surprising to find that only four sources covered the subject, and from varying viewpoints. One article developed a framework for identifying social and technical aspects of integration in the project management concept (Kirsila et al., 2007). Integration management components were proposed and the respective effects on project management performance evaluated (Demirkesen and Ozorhon, 2017). One source covered how integration is managed from a project phase up to the operations phase in an inter-organisational entity and identified

the project phase integration mechanisms, which facilitate value creation in the operations phase (Arto et al., 2016). Furthermore, one study of integration dynamics revealed how integration mechanisms were adopted and how the mechanisms were adjusted during an alliance project (Hietajärvi et al., 2017).

4.2.1 Contractual integration

The two papers recognised to cover contractual integration were the works of Carpintero and Petersen (2015) and Clifton and Duffield (2006). Two alternative models organising public-private-partnership (PPP) infrastructure projects and the respective implications on project management were evaluated (Carpintero and Petersen, 2015). Also, integrating the project alliance principles into PPP projects was studied (Clifton and Duffield, 2006). Notably both of the papers dealt with PPP projects, and other contractual or procurement related perspectives seemed to be mostly absent within the analysed sources.

4.2.2 Relational integration

One of the most evident streams of research pinpointed in our analysis was relational integration. The references in this cluster examined behavioural integration, collaboration, and various aspects related to the abovementioned. In addition, organisational integration in relation to the behavioural and relationship aspects was examined in the articles. The sources focusing on relational integration were the works of Zou et al. (2014), Gustavsson and Gohary (2012), Suprpto et al. (2015a, 2015b), Mollaoglu et al. (2015), Mesa et al. (2016), Aagaard et al. (2014), Manu et al. (2015), Oraee et al. (2017), Bygstad and Lanestedt (2009) and Li et al. (2001).

Interestingly, an inter-team collaborative process was discovered as essential to improving the project success (Suprpto et al., 2015a). Project outcomes were identified to be very sensitive to collaborative practices such as communication, alignment of interests, team working, trust, and pain/gain sharing (Mesa et al., 2016). Furthermore, building strong collaboration and integration between an IT service providing organisation and external users during the IT project phase was recognised as key to service innovations (Bygstad and Lanestedt, 2009).

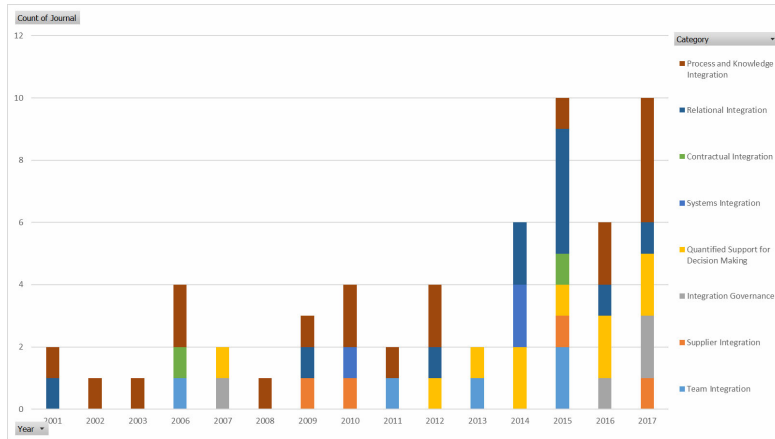
Trust was proposed to be the key in enabling collaboration, integration, and the respective benefits, and issues influencing the development of trust were introduced in the analysed literature (Manu et al., 2015). Partnering as a form of promoting collaboration and integration, barriers, and tools to partnering were recognised (Li et al., 2001; Mollaoglu et al., 2015). Altogether, the literature presents collaborative project practices and how collaboration can be enhanced in practice (Aagaard et al., 2014; Gustavsson and Gohary, 2012). In addition, the project management practitioner's perspectives on the importance of collaborative practices were examined and listed (Suprpto et al., 2015b). Relationship management and organisational integration in PPPs were discussed in one source (Zou et al., 2014).

BIM being identified as an integrative technology, the main part of the literature up to now has focused on technology as a collaboration antecedent in BIM based collaboration networks, overlooking viewpoints of project-related and managerial antecedents (Oraee et al., 2017).

Table 2 Results of the literature review – a conceptual framework on integration of project networks

<i>Cluster/concept</i>	<i>Key findings/streams of discussion</i>	<i>Empirical approaches</i>	<i>Industrial sectors</i>	<i>Sources</i>
1 Integration governance	Components of integration management and their effectiveness, social and technical aspects of integration, integration mechanisms and dynamics, integration mechanisms in project phase facilitating integration in operations phase	Single case study, multiple case study, surveys and interviews	Construction, infrastructure	Demirkessen and Ozorhon (2017), Kirsila et al. (2007), Hietajarvi et al. (2017) and Arto et al. (2016)
1.1 Contractual integration	Integration of alliance principles into PPP projects, alternative models of organising PPP projects	Multiple case study, surveys and interviews	Infrastructure	Capintero and Petersen (2015) and Clifton and Duffield (2006)
1.2 Relational integration	Collaboration essential on improving project outcomes, collaboration through partnering and barriers to collaboration, collaboration with external users key to service innovations, trust, collaborative practices, BIM as a collaborative technology	Single case study, multiple case study, surveys and interviews, bibliometric study, quantitative methods, simulation, other	Construction, infrastructure, other	Zou et al., (2014), Gustavsson and Gohary (2012), Suprpto et al. (2015a, 2015b), Mollaoglu et al. (2015), Mesa et al. (2016), Aagaard et al. (2014), Manu et al. (2015), Orace et al. (2017), Bygstad and Lanestedt (2009) and Li et al. (2001)
1.3 Team integration	Facilitators for team integration, characteristics of and cornerstones for developing integrated teams, managerial practices leading to full or partial team integration or fragmentation, key indicators for the success of integrated teams, framework for influencing the indicators	Single case study, multiple case study, surveys and interviews	Construction	Buvik and Rolfsen (2015), Khairil et al. (2015), Aapaaja et al. (2013), Baiden et al. (2006) and Baiden and Price (2011)
1.4 Process and knowledge integration	Knowledge integration enablers and activities, learning in project context, social capital, integrating IT systems to provide better support for business processes, integration of existing software applications through unified processes and tools, stakeholder integration process and management, integration of risk management practices and processes between sites, integrating risk management practices and processes to other project management processes, integrating the stakeholder management to the risk management process, integration of design, construction, and operations phases of a project, task integration	Single case study, multiple case study, surveys and interviews, other qualitative methods, other	Construction, infrastructure, IT, other	Emberg (2012), Fuller et al. (2011), Ratcheva (2009), Bony (2010), Di Vincenzo and Mascia (2012), Ndom and Elhag (2010), Yang et al. (2006), Austin et al. (2002), Dyer (2017), Kamara et al. (2001), Kleiss and Imura (2006), Currie (2003), Wagner et al. (2017), Arashpour et al. (2017), Salaka and Prabhu (2008), Demir et al. (2015), Rajablu et al. (2017), Yeo et al. (2016) and Arashpour et al. (2016)
1.5 Supplier integration	Supplier collaboration and control, upstream operational integration via resource allocation and collaboration, reflective PM and SCM approaches in building integrated supply chain	Single case study, multiple case study, surveys and interviews	Construction, infrastructure, industrial systems, deliveries	Martinsuo and Ahola (2010), Ahola et al. (2017), Zerjav (2015) and Zuo et al. (2009)
1.5.1 Systems integration	Systems integration as a structure and a process of coping with the complexity, managerial approaches and common practices in managing the complexity, understanding and managing the social aspect of systems integration: customer needs	Single case study, multiple case study, other qualitative methods	Construction, industrial systems, deliveries	Linamata and Gustafsson (2010), Brady and Davies (2014) and Davies and Mackenzie (2014)
2 Quantified support for decision making	Integrating project control and knowledge, integrating project control and forecasting, quantifying risk management, project prediction and diagnosis model enabling	Quantitative methods, simulation, other	Construction, infrastructure, oil and gas, other	Hazir (2015), Batselier and Vanhoucke (2017), Caron et al. (2016), Wang et al. (2007) and Maguaye et al. (2014)

Figure 5 Articles related to clusters of the developed framework, published annually (see online version for colours)



4.2.3 Team integration

The sources identified examining integrated teams were the works of Buvik and Rolfsen (2015), Khairil et al. (2015), Aapaoja et al. (2013), Baiden et al. (2006) and Baiden and Price (2011). The articles focusing on team integration also covered the issue of knowledge integration and collaboration. However, team integration being an established concept, and the articles covering relatively practical building blocks for the respective integration, it was given its own classification in our analysis.

The key facilitators for team integration were pinpointed in the literature: prior relationships and shared experience enabling the development of trust between the team members (Buvik and Rolfsen, 2015). Twelve characteristics of an integrated team were identified and cornerstones of developing integrated teams defined (Aapaoja et al., 2013). The literature related to team integration was rather practical, since even the managerial practices resulting in full or partial team integration or fragmentation were identified (Baiden et al., 2006). The key indicators influencing the success of a team integration in construction projects were recognised as being single team focus and objectives, trust and respect, commitment from top management, free flow of communication, and no blame culture (Khairil et al., 2015). In addition, the framework for influencing the indicators was identified: it can take place through team formation, contractual model, teamwork principle, and operational monitoring (Khairil et al., 2015). However, a call for more research related to the factors that directly affect the impact on integrated teamwork effectiveness was raised (Baiden and Price, 2011). Altogether, the stream of literature on team integration appeared to have one of the highest levels of coherency and to provide probably some of the most practical managerial implications amongst the analysed literature.

4.2.4 Process and knowledge integration

The research papers discovered that focused on knowledge integration were the works of Enberg (2012), Fuller et al. (2011), Ratcheva (2009), Bony (2010), Di Vincenzo and Mascia (2012) and Ndoni and Elhag (2010). Knowledge integration enablers and activities were identified in the literature (Enberg, 2012; Ndoni and Elhag, 2010; Ratcheva, 2009), in addition to examining how knowledge integration fosters learning in a project context (Fuller et al., 2011). It was also discussed how national context affects the integration of project management (Bony, 2010) and how social capital affects knowledge integration (Di Vincenzo and Mascia, 2012).

Sources covering different viewpoints related to process integration were distinguished as being the works of Yang et al. (2006), Austin et al. (2002), Dyer (2017), Kamara et al. (2001), Kleiss and Imura (2006), Currie (2003), Wagner et al. (2017), Arashpour et al. (2016, 2017), Salaka and Prabhu (2008), Demir et al. (2015), Rajablu et al. (2017) and Yeo et al. (2016).

Process integration was examined through several different perspectives in the analysed literature. Three articles elaborated on the integration of IT systems into business processes, especially the integration of IT systems with each other in order to provide better support for business processes, and integration of software applications with the existing processes and partners in a business network (Currie, 2003; Wagner et al., 2017). Furthermore the definition of a unified process and tools for supporting organisations to manage integration of existing software applications were discussed (Salaka and Prabhu, 2008). Also, integration and automation within and between work functions in projects were analysed, the results being that levels of technology usage in projects had positive associations on project outcomes (Yang et al., 2006). One article suggested a process and management model for successful stakeholder integration (Rajablu et al., 2017).

Another major perspective on process integration within project networks was integration of risk management. Integration of risk management practices and processes between different construction sites was suggested, in order to gain better results (Arashpour et al., 2017). Integrating risk management practices and processes to other project management processes was evaluated in a risk management capability maturity model (Yeo et al., 2016). Furthermore, it was recommended to put an emphasis on managing the risks related to coordination activities within different project sites (Arashpour et al., 2016). Stakeholder analysis and risk management were proposed to be integrated through extended power-interest-matrix (Demir et al., 2015). An alternative standpoint of megaproject risk management, managing stakeholder cultural aspects and social responsibilities, and integrating this aspect to the risk management process, was introduced in the literature (Dyer, 2017).

Articles also elaborated on the perspectives of integration of planning, construction, and operations processes within a construction project. A framework for integrating planning, construction, and operations processes, in addition to a technique for integrating planning and construction processes, was introduced in the literature (Austin et al., 2002; Kamara et al., 2001). It was proven that the investment lifecycle costs could be reduced via integrating the planning, construction, and operations phases of an infrastructure investment project (Kleiss and Imura, 2006).

4.2.5 Supplier integration

The sources in which the main perspective was identified to be supplier integration were the works of Martinsuo and Ahola (2010), Ahola et al. (2017), Zerjav (2015) and Zuo et al. (2009). Even though the articles were categorised under supplier integration, the sources mainly focused on horizontal integration perspectives, thus they did not elaborate on supply chain integration in a traditional sense. Supplier integration was defined as collaboration and control between the project contractor and supplier during project execution (Martinsuo and Ahola, 2010). Managerial strategies were proposed in order to achieve upstream operational integration, being resource allocation, collaborative arrangements such as alliances, and collaborative problem solving (Zerjav, 2015). A more reflective supply chain management and project management approach in building an integrated supply chain were also called for (Zuo et al., 2009). Altogether, one article mentioned that the integrative activities identified in previous empirical research, aiming at supplier integration, varied considerably amongst individual studies (Ahola et al., 2017), which can also be concluded based on our analysis.

4.2.5.1 Systems integration

The sources we discovered to be examining systems integration in complex project networks were the works of Liinamaa and Gustafsson (2010), Brady and Davies (2014) and Davies and Mackenzie (2014). Yet again, it was surprising to find only three articles focusing on this subject.

Systems integration as a structure and process for coping with project complexity was defined in one article (Davies and Mackenzie, 2014). It was noted that the practical approaches to systems integration may vary, however, some common practices to manage the structural and dynamic complexity of large projects could be identified (Brady and Davies, 2014). Furthermore, the social dimension of systems integration was examined, the findings being that understanding and managing the customer needs as a part of systems integration had significant positive impacts on project outcomes (Liinamaa and Gustafsson, 2010).

4.3 Quantified support for decision making

Probably the most divergent stream of literature we identified was classified under the umbrella of quantified support for decision making. The references in the cluster in question focusing on quantified support for decision making were the works of Hazir (2015), Batselier and Vanhoucke (2017), Caron et al. (2016), Wang et al. (2007), Magnaye et al. (2014), Cardenas et al. (2017), Lu et al. (2016), Caron et al. (2013), Vanhoucke (2012) and Espinoza (2014). The sources examined different perspectives on moving formalised and quantified data upwards in the organisation, thus providing quantified data to support the decision making process as defined by Galbraith (Galbraith, 1974).

Improving project control mechanisms by integrating data and knowledge were one major standpoint in the stream of literature in question (Caron et al., 2013, 2016; Hazir, 2015). In addition, an information integration model for electronic commerce application

was developed (Wang et al., 2007). Integration of project control and forecasting mechanisms were examined (Batselier and Vanhoucke, 2017), as well as integration of scheduling and financing functions of project management (Lu et al., 2016). Furthermore, the measuring of project control efficiency was also researched (Vanhoucke, 2012). An approach and a tool for evaluating the state of system integration was analysed (Magnaye et al., 2014). A model for quantifying the project risks and their effect to predict cash flows were introduced (Espinoza, 2014). Furthermore, a prediction and diagnosis model enabling decision making in infrastructure projects was generated in one source (Cardenas et al., 2017).

5 Discussion

In this paper, we have developed an improved understanding of the conceptual positions, which can be taken both in research and in practice as integrating complex project networks. Our analysis has revealed both theoretical and practical saturation points and avenues for further research efforts. The paper has proven the research area is an emerging one in the field of project management, gaining growing attention during this decade, where the empirical input has until recently mainly comes from construction and infrastructure sectors. However, our analysis also stresses the importance of providing further academic research, which has more variations in empirical standpoints, industries covered, and in research methods, but which has more established theoretical standpoints.

The conducted systematic literature review and qualitative content analysis of 60 articles ended up in proposing a framework umbrella for integration of project networks. The streams of the literature were identified and grouped around the following clusters, forming a conceptual framework: integration governance, contractual integration, systems integration, relational integration, team integration, process and knowledge integration, supplier integration, and quantified support for decision making. As stated earlier, the streams are partly overlapping but, according to our analysis, consistent enough.

Altogether, this paper makes eight main contributions to how integration is represented in the context of project networks. The contributions are presented in Table 3.

Table 3 Contributions to how integration is represented in the context of project networks

<i>Contributions to how integration is represented in the context of project networks</i>
<ul style="list-style-type: none"> • Expanding empirical viewpoints for more industrial sectors are called for • Clarity is called for on the performance effects of integration in project networks • Only a vague representation on integration can be achieved in project networks • No consensus on integration governance • Under-representation of contractual issues and respective implications on integration • Most consistent stream focuses on team integration • Integration in project networks is mainly about collaboration, relationship and behavioural aspects • No theoretical coherence on integration in project networks

First, one of the most striking notions was that the approaches on integration in project networks are not theoretically consistent, proven alone by the amount of categories in the initial coding. Each analysed article had examined integration from its original viewpoint without any clear consensus on theoretical lenses or even the terminology used. Terminology referring to the same aspects of integration differed from paper to paper. Furthermore, articles focusing on the same integration-related phenomenon used different terminologies and theoretical lenses.

Second and in contrast, coherently, integration in project networks seems to be mainly about collaboration, in addition to the relationship and behavioural aspects of and between individuals. Analysis revealed collaboration as the universal theme within the articles, overlapping most of the streams in the conceptual framework, and even the individual articles. Interestingly, even the articles focusing on providing quantified support for decision making analysed how data and knowledge can be integrated.

Third, the most consistent stream of academic discussion appeared to focus on team integration. Furthermore, some of the most practical managerial recommendations were provided in relation to team integration. In addition, team integration was the most evident stream of analysed literature, which addressed the state variable of integration as defined by, for example, Turkulainen and Ketokivi (2012). The maturity levels of the achieved team integration (Baiden et al., 2006; Baiden and Price, 2011) represent a good example of how the state of integration could be evaluated and measured.

Fourth, we could not find a clear consensus on how integration ought to be governed in project networks. Surprisingly few articles covered the issue at all, while the perspectives on it were not coherent. The framework stream focusing on systems integration had developed the most evident efforts in this direction. Furthermore, the review revealed only one attempt to grasp the elements of integration dynamics (Hietajärvi et al., 2017). One explanation for this might be the fact that project networks differ in complexity, seriality, variety, and other aspects (Manning, 2017). Further research is required, however, on whether some common framework can be identified on governing project networks integration.

Fifth, clarity is called for on what are the performance effects of integration in project networks. Some authors have elaborated the field (Mesa et al., 2016; Suprpto et al., 2015a), however more intakes are needed. Previous studies have identified integration as central to the performance of a network, but not solely ensuring a good performance: Well-performing organisations do not constitute a well-performing network without integration; however, integrated network does not perform well if the individual organisations perform poorly (Provan and Milward, 1995). In addition, network structure in terms of centralised integration and direct external control, and network context, has proven to have direct consequences on network effectiveness (Provan and Milward, 1995). Furthermore, referring to the outcomes of integration, empirical findings in the field of operations management suggest that even though the level of achieved integration has a positive effect on operational performance, the performance effect varies from one performance dimension to the next (Turkulainen and Ketokivi, 2012). Which are the respective dimensions and effects in the field of project networks?

Sixth, there seems to be clear under-representation of contractual issues related to project networks and the respective implications on integration activities. Only two sources elaborated the issue (Carpintero and Petersen, 2015; Clifton and Duffield, 2006). Even though, by definition, the project networks consist of legally independent

organisations (Manning, 2017), there is a clear need for intakes examining contractual and procurement-related issues.

Furthermore, expanding empirical viewpoints for industrial sectors other than construction and infrastructure is called for, which is our seventh contribution. The vast majority, nearly 60%, of the articles examined construction industry or infrastructure projects. This is understandable since the projects in the industries in question are large entities, involving multiple stakeholders, and the industries are rather traditional. However, emerging fields such as studies on integration related to digitalisation efforts and integration of IT systems and business processes were hard to come by in the analysed project management related journals, and only a few articles covered these sorts of issues. Although, we are aware the sample of industrial sectors may be biased due to the fact we reviewed only project management related journals.

Eighth and finally, a vague representation exists on how integration can actually be achieved in project networks. In other words, the analysed literature does not comprehensively answer the question of how the process of integration actually takes place, nevertheless how it ought to be managed. We could not find a coherent representation of what the essential steps are in order to actually achieve integration in project networks and which is closest to the exact process of achieving the unity of effort as defined by Lawrence and Lorsch (1967).

6 Conclusions

To conclude, whereas the production system of complex products must be created and implemented before it is possible to produce any products at all, similarly, and even more importantly, the project or system of producing the complex products must be carefully developed and implemented (Browning et al., 2006). However, according to this study, the vast integration literature up to now provides only fragmented perspectives on how the integration of a project network is optimally built, coordinated, managed, and measured. The framework developed in this study can be used as a basis for developing and implementing the integration efforts in a project network. However, the categories in the developed framework, and respective connections between the categories, are an avenue for further research. Nevertheless, more systematic research efforts on how to build, manage, and measure integration in project networks are called for.

Finally, this study has its limitations. First, the analysis is based only on articles published in project management related journals. The purpose of the analysis was to grasp the current discourse on project network integration especially in the general project management discipline. However, the authors were aware this excludes some major streams of field-specific discussion on integration, for example in operations management, industrial marketing management and construction related journals.

Another limitation of this study is that the proposed streams of discussion and the developed conceptual framework have not been tested in practice. An avenue for further research is to gain empirical evidence and develop the framework, respectively.

References

- Aagaard, A., Eskerod, P. and Madsen, E.S. (2014) 'Key drivers for informal project coordination among sub-contractors A case study of the offshore wind energy sector', *International Journal of Managing Projects in Business*, Vol. 8, No. 2, pp.222–240.
- Aapaoja, A., Herrala, M., Pekuri, A. and Haapasalo, H. (2013) 'The characteristics of and cornerstones for creating integrated teams', *International Journal of Managing Projects in Business*, Vol. 6, No. 4, pp.695–713.
- Ahola, T., Vuori, M. and Viitamo, E. (2017) 'Sharing the burden of integration: an activity-based view to integrated solutions provisioning', *International Journal of Project Management*, Vol. 35, No. 6, pp.1006–102 [online] <https://doi.org/10.1016/j.ijproman.2017.05.002>.
- Arashpour, M., Abbasi, B., Arashpour, M., Hosseini, M.R. and Yang, R. (2017) 'Integrated management of on-site, coordination and off-site uncertainty: theorizing risk analysis within a hybrid project setting', *International Journal of Project Management*, Vol. 35, No. 4, pp.647–655 [online] <https://doi.org/10.1016/j.ijproman.2017.02.016>.
- Arashpour, M., Wakefield, R., Lee, E.W.M., Chan, R. and Hosseini, M.R. (2016) 'Analysis of interacting uncertainties in on-site and off-site activities: Implications for hybrid construction', *International Journal of Project Management*, Vol. 34, pp.1393–1402 [online] <https://doi.org/10.1016/j.ijproman.2016.02.004>.
- Artto, K., Ahola, T. and Vartiainen, V. (2016) 'From the front end of projects to the back end of operations: managing projects for value creation throughout the system lifecycle', *International Journal of Project Management*, Vol. 34, No. 2, pp.258–270 [online] <https://doi.org/10.1016/j.ijproman.2015.05.003>.
- Austin, S., Newton, A., Steele, J. and Waskett, P. (2002) 'Modelling and managing project complexity', *International Journal of Project Management*, Vol. 20, No. 3, pp.191–198.
- Baiden, B.K. and Price, A.D.F. (2011) 'The effect of integration on project delivery team effectiveness', *International Journal of Project Management*, Vol. 29, No. 2, pp.129–136 [online] <https://doi.org/10.1016/j.ijproman.2010.01.016>.
- Baiden, B.K., Price, A.D.F. and Dainty, A.R.J. (2006) 'The extent of team integration within construction projects', *International Journal of Project Management*, Vol. 24, pp.13–23 [online] <https://doi.org/10.1016/j.ijproman.2005.05.001>.
- Bakker, R.M. (2010) 'Taking stock of temporary organizational forms: a systematic review and research agenda', *International Journal of Management Reviews*, Vol. 12, No. 4, pp.466–486 [online] <https://doi.org/10.1111/j.1468-2370.2010.00281.x>.
- Barki, H. and Pinsonneault, A. (2005) 'A model of organizational integration, implementation effort, and performance', *Organization Science*, Vol. 16, No. 2, pp.165–179 [online] <https://doi.org/10.1287/orsc.1050.0118>.
- Batselier, J. and Vanhoucke, M. (2017) 'Improving project forecast accuracy by integrating earned value management with exponential smoothing and reference class forecasting', *International Journal of Project Management*, Vol. 35, No. 1, pp.28–43 [online] <https://doi.org/10.1016/j.ijproman.2016.10.003>.
- Bechky, B.A. (2006) 'Gaffers, gofers, and grips: role-based coordination in temporary organizations', *Organization Science*, Vol. 17, No. 1, pp.3–21 [online] <https://doi.org/10.1287/orsc.1050.0149>.
- Bony, J.D. (2010) 'Project management and national culture: a Dutch-French case study', *International Journal of Project Management*, Vol. 28, No. 2, pp.173–182 [online] <https://doi.org/10.1016/j.ijproman.2009.09.002>.
- Brady, T. and Davies, A. (2014) 'Managing structural and dynamic complexity: a tale of two projects', *Project Management Journal*, Vol. 45, No. 4, pp.21–38 [online] <https://doi.org/10.1002/pmj>.
- Browning, T.R., Fricke, E. and Negele, H. (2006) 'Key concepts in modeling product development processes', *Systems Engineering*, Vol. 9, No. 2, pp.104–128 [online] <https://doi.org/10.1002/sys.20047>.

- Buvik, M.P. and Rolfsen, M. (2015) 'Prior ties and trust development in project teams – a case study from the construction industry', *International Journal of Project Management*, Vol. 33, No. 7, pp.1484–1494 [online] <https://doi.org/10.1016/j.ijproman.2015.06.002>.
- Bygstad, B. and Lanestedt, G. (2009) 'ICT based service innovation – a challenge for project management', *International Journal of Project Management*, Vol. 27, No. 3, pp.234–242 [online] <https://doi.org/10.1016/j.ijproman.2007.12.002>.
- Cardenas, I.C., Voordijk, H. and Dewulf, G. (2017) 'Beyond theory: towards a probabilistic causation model to support project governance in infrastructure projects', *International Journal of Project Management*, Vol. 35, No. 3, pp.432–450 [online] <https://doi.org/10.1016/j.ijproman.2017.01.002>.
- Caron, F., Ruggeri, F. and Merli, A. (2013) 'A Bayesian approach to improve estimate at completion in earned value management', *Project Management Journal*, Vol. 44, No. 1, pp.3–16 [online] <https://doi.org/10.1002/pmj>.
- Caron, F., Ruggeri, F. and Pierini, B. (2016) 'A Bayesian approach to improving estimate to complete', *International Journal of Project Management*, Vol. 34, No. 8, pp.1687–1702 [online] <https://doi.org/10.1016/j.ijproman.2016.09.007>.
- Carpintero, S. and Petersen, O.H. (2015) 'Bundling and unbundling in public-private partnerships: implications for risk sharing in urban transport projects', *Project Management Journal*, Vol. 46, No. 4, pp.35–46 [online] <https://doi.org/10.1002/pmj>.
- Clifton, C. and Duffield, C.F. (2006) 'Improved PFI / PPP service outcomes through the integration of alliance principles', *International Journal of Project Management*, Vol. 24, No. 7, pp.573–586 [online] <https://doi.org/10.1016/j.ijproman.2006.07.005>.
- Currie, W.L. (2003) 'A knowledge-based risk assessment framework for evaluating web-enabled application outsourcing projects', *International Journal of Project Management*, Vol. 21, No. 3, pp.207–217.
- Davies, A., Brady, T. and Hobday, M. (2007) 'Organizing for solutions: systems seller vs. systems integrator', *Industrial Marketing Management*, Vol. 36, No. 2, pp.183–193 [online] <https://doi.org/10.1016/j.indmarman.2006.04.009>.
- Davies, A. and Mackenzie, I. (2014) 'Project complexity and systems integration: constructing the London 2012 Olympics and Paralympics Games', *International Journal of Project Management*, Vol. 32, No. 5, pp.773–790 [online] <https://doi.org/10.1016/j.ijproman.2013.10.004>.
- DeFillippi, R. and Sydow, J. (2016) 'Project networks: governance choices and paradoxical tensions', *Project Management Journal*, Vol. 47, No. 5, pp.6–17 [online] <https://doi.org/10.1177/875697281604700502>.
- Demir, S.T., Bryde, D.J., John, F.D. and Ochieng, E.G. (2015) 'Three dimensional stakeholder analysis – 3dSA: adding the risk dimension for stakeholder analysis', *International Journal of Project Organization and Management*, Vol. 7, No. 1, p.15 [online] <https://doi.org/10.1504/IJPOM.2015.068002>.
- Demirkesen, S. and Ozorhon, B. (2017) 'Impact of integration management on construction project management performance', *International Journal of Project Management*, Vol. 35, No. 8, pp.1639–1654 [online] <https://doi.org/https://doi.org/10.1016/j.ijproman.2017.09.008>.
- Di Vincenzo, F. and Mascia, D. (2012) 'Social capital in project-based organizations: its role, structure, and impact on project performance', *International Journal of Project Management*, Vol. 30, No. 1, pp.5–14 [online] <https://doi.org/10.1016/j.ijproman.2011.03.006>.
- Dyer, R. (2017) 'Cultural sense-making integration into risk mitigation strategies towards megaproject success', *International Journal of Project Management*, Vol. 35, No. 7, pp.1338–1349 [online] <https://doi.org/10.1016/j.ijproman.2016.11.005>.
- Enberg, C. (2012) 'Enabling knowledge integration in cooperative R&D projects – the management of conflicting logics', *International Journal of Project Management*, Vol. 30, No. 7, pp.771–780 [online] <https://doi.org/10.1016/j.ijproman.2012.01.003>.

- Espinoza, R.D. (2014) 'Separating project risk from the time value of money: a step toward integration of risk management and valuation of infrastructure investments', *International Journal of Project Management*, Vol. 32, No. 6, pp.1056–1072 [online] <https://doi.org/10.1016/j.ijproman.2013.12.006>
- Fink, A. (1998) *Conducting research Literature Reviews – From Paper to the Internet*, Sage Publications Inc., London.
- Fuller, P.A., Dainty, A.R.J. and Thorpe, T. (2011) 'Improving project learning: a new approach to lessons learnt', *International Journal of Managing Projects in Business*, Vol. 4, No. 1, pp.118–136.
- Galbraith, J.R. (1974) 'Organization design: an information processing view', *Interfaces*, Vol. 4, pp.28–36.
- Gustavsson, T.K. and Gohary, H. (2012) 'Boundary action in construction projects: new collaborative project practices', *International Journal of Managing Projects in Business*, Vol. 5, No. 3, pp.364–376.
- Hazir, Ö. (2015) 'A review of analytical models, approaches and decision support tools in project monitoring and control', *International Journal of Project Management*, Vol. 33, No. 4, pp.808–815 [online] <https://doi.org/10.1016/j.ijproman.2014.09.005>.
- Hellgren, B. and Stjernberg, T. (1995) 'Design and implementation in major investments – a project network approach', *Scandinavian Journal of Management*, Vol. 11, No. 4, pp.377–394.
- Hietajärvi, A.-M., Aaltonen, K. and Haapasalo, H. (2017) 'Managing integration in infrastructure alliance projects Dynamics of integration mechanisms', *International Journal of Managing Projects in Business*, Vol. 10, No. 1, pp.5–31.
- Hobday, M., Davies, A. and Prencipe, A. (2005) 'Systems integration: a core capability of the modern corporation', *Industrial and Corporate Change*, Vol. 14, No. 6, pp.1109–1143 [online] <https://doi.org/10.1093/icc/dth080>.
- Jacobsson, M., Lundin, R.A. and Söderholm, A. (2015) 'Researching projects and theorizing families of temporary organizations', *Project Management Journal*, Vol. 46, No. 5, pp.9–18 [online] <https://doi.org/10.1002/pmj>.
- Jobling, P.E. and Smith, N.J. (2018) 'Experience of the role of contracts in megaproject execution', *Management, Procurement and Law*, Vol. 171, No. MP1, pp.18–24.
- Johnson, S.B. (2013) 'Technical and institutional factors in the emergence of project management', *International Journal of Project Management*, Vol. 31, No. 5, pp.670–681 [online] <https://doi.org/10.1016/j.ijproman.2013.01.006>.
- Kamara, J.M., Anumba, C.J. and Evbuomwan, N.F.O. (2001) 'Assessing the suitability of current briefing practices in construction within a concurrent engineering framework', *International Journal of Project Management*, Vol. 19, pp.337–351.
- Khairil, C.K., Ibrahim, C., Costello, S.B. and Wilkinson, S. (2015) 'Key indicators influencing the management of team integration in construction projects', *International Journal of Managing Projects in Business*, Vol. 8, No. 2, pp.300–323.
- Kirsila, J., Hellström, M. and Wikström, K. (2007) 'Integration as a project management concept: a study of the commissioning process in industrial deliveries', *International Journal of Project Management*, Vol. 25, pp.714–721 [online] <https://doi.org/10.1016/j.ijproman.2007.02.005>.
- Kleiss, T. and Imura, H. (2006) 'The Japanese private finance initiative and its application in the municipal solid waste management sector', *International Journal of Project Management*, Vol. 24, No. 7, pp.614–621 [online] <https://doi.org/10.1016/j.ijproman.2006.07.007>.
- Lawrence, P.R. and Lorsch, J.W. (1967) 'Differentiation and integration in complex organizations', *Administrative Science Quarterly*, Vol. 12, No. 1, pp.1–47 [online] <https://doi.org/10.2307/2391211>.
- Li, H., Cheng, E.W.L., Love, P.E.D. and Irani, Z. (2001) 'Co-operative benchmarking: a tool for partnering excellence in construction', *International Journal of Project Management*, Vol. 19, No. 3, pp.171–179 [online] [https://doi.org/10.1016/S0263-7863\(99\)00033-2](https://doi.org/10.1016/S0263-7863(99)00033-2).

- Ligthart, R., Oerlemans, L. and Noorderhaven, N. (2016) 'In the shadows of time: a case study of flexibility behaviors in an interorganizational project', *Organization Studies*, Vol. 37, No. 12, pp.1721–1743 [online] <https://doi.org/10.1177/0170840616655487>.
- Liinamaa, J. and Gustafsson, M. (2010) 'Integrating the customer as part of systems integration', *International Journal of Managing Projects in Business*, Vol. 3, No. 2, pp.197–215.
- Lu, Q., Won, J. and Cheng, J.C.P. (2016) 'A financial decision making framework for construction projects based on 5D building information modeling (BIM)', *International Journal of Project Management*, Vol. 34, No. 1, pp.3–21 [online] <https://doi.org/10.1016/j.ijproman.2015.09.004>.
- Lumineau, F. and Oliveira, N. (2018) 'A pluralistic perspective to overcome major blind spots in research on interorganizational relationships', *Academy of Management Annals*, annals.2016.0033 [online] <https://doi.org/10.5465/annals.2016.0033>.
- Lundin, R.A. and Söderholm, A. (2013) 'Temporary organizations and end states: a theory is a child of its time and in need of reconsideration and reconstruction', *International Journal of Managing Projects in Business*, Vol. 6, No. 3, pp.587–594.
- Magnaye, R., Sauser, B., Patanakul, P., Nowicki, D. and Randall, W. (2014) 'Earned readiness management for scheduling, monitoring and evaluating the development of complex product systems', *International Journal of Project Management*, Vol. 32, No. 7, pp.1246–1259 [online] <https://doi.org/10.1016/j.ijproman.2014.01.009>.
- Manning, S. (2017) 'The rise of project network organizations: building core teams and flexible partner pools for interorganizational projects', *Research Policy*, Vol. 46, No. 8, pp.1399–1415 [online] <https://doi.org/10.1016/j.respol.2017.06.005>.
- Manu, E., Ankrah, N., Chinyio, E. and Proverbs, D. (2015) 'Trust influencing factors in main contractor and subcontractor relationships during projects', *International Journal of Project Management*, Vol. 33, No. 7, pp.1495–1508 [online] <https://doi.org/10.1016/j.ijproman.2015.06.006>.
- Martinsuo, M. and Ahola, T. (2010) 'Supplier integration in complex delivery projects: comparison between different buyer – supplier relationships', *International Journal of Project Management*, Vol. 28, No. 2, pp.107–116 [online] <https://doi.org/10.1016/j.ijproman.2009.09.004>.
- Mesa, H.A., Molenaar, K.R. and Alarcón, L.F. (2016) 'Exploring performance of the integrated project delivery process on complex building projects', *International Journal of Project Management*, Vol. 34, No. 7, pp.1089–1101 [online] <https://doi.org/10.1016/j.ijproman.2016.05.007>.
- Mitropoulos, P. and Tatum, C.B. (2000) 'Management-driven integration', *Journal of Management in Engineering*, Vol. 16, No. 1, pp.48–58.
- Mollaoglu, S., Sparkling, A. and Thomas, S. (2015) 'An inquiry to move an underutilized best practice forward: barriers to partnering in the architecture, engineering, and construction industry', *Project Management Journal*, Vol. 46, No. 1, pp.69–83 [online] <https://doi.org/10.1002/pmj>.
- Ndoni, D.H. and Elhag, T.M.S. (2010) 'The integration of human relationships in capital development projects: a case study of BSF scheme', *International Journal of Managing Projects in Business*, Vol. 3, No. 3, pp.479–494.
- Oliveira, N. and Lumineau, F. (2017) 'How coordination trajectories influence the performance of interorganizational project networks', *Organizational Science*, October, pp.1–32 [online] <https://doi.org/10.1287/orsc.2017.1151>.
- Orace, M., Hosseini, M.R., Papadonikolaki, E., Palliyaguru, R. and Arashpour, M. (2017) 'Collaboration in BIM-based construction networks: a bibliometric-qualitative literature review', *International Journal of Project Management*, Vol. 35, No. 7, pp.1288–1301 [online] <https://doi.org/10.1016/j.ijproman.2017.07.001>.
- Padalkar, M. and Gopinath, S. (2016) 'Six decades of project management research: thematic trends and future opportunities', *International Journal of Project Management*, Vol. 34, No. 7, pp.1305–1321 [online] <https://doi.org/10.1016/j.ijproman.2016.06.006>.

- Project Management Institute (2013) *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 4th ed., Project Management Institute, Inc., Pennsylvania, USA.
- Provan, K.G. and Milward, H.B. (1995) 'A preliminary theory of interorganizational network effectiveness: a comparative study of four community mental health systems', *Administrative Science Quarterly*, Vol. 40, No. 1, p.1 [online] <https://doi.org/10.2307/2393698>.
- Rajablu, M., Hamdi, S., Marthandan, G. and Wan Yusoff, W.F. (2017) 'Managing for stakeholders: Introducing stakeholder metrics-integrated model to lead project ethics and success', *International Journal of Project Organisation and Management*, Vol. 9, No. 1, pp.31–56 [online] <https://doi.org/10.1504/IJPOM.2017.083124>.
- Ramasesh, R.V. and Browning, T.R. (2014) 'A conceptual framework for tackling knowable unknown unknowns in project management', *Journal of Operations Management*, Vol. 32, No. 4, pp.190–204 [online] <https://doi.org/10.1016/j.jom.2014.03.003>.
- Ratcheva, V. (2009) 'Integrating diverse knowledge through boundary spanning processes – the case of multidisciplinary project teams', *International Journal of Project Management*, Vol. 27, No. 3, pp.206–215 [online] <https://doi.org/10.1016/j.ijproman.2008.02.008>.
- Salaka, V. and Prabhu, V. (2008) 'Project management and scheduling for enterprise integration', *International Journal of Project Organisation and Management*, Vol. 1, No. 2, pp.167–184, <https://dx.doi.org/10.1504/IJPOM.2008.022190>.
- Schreier, M. (2012) *Qualitative Content Analysis in Practice*, Sage Publications Inc, London.
- Söderlund, J. (2012) 'Project management, interdependencies, and time insights from managing large systems by Sayles and Chandler', *International Journal of Managing Projects in Business*, Vol. 5, No. 4, pp.617–633.
- Suprpto, M., Bakker, H.L.M. and Mooi, H.G. (2015a) 'Relational factors in owner-contractor collaboration: the mediating role of teamworking', *International Journal of Project Management*, Vol. 33, No. 6, pp.1347–1363 [online] <https://doi.org/10.1016/j.ijproman.2015.03.015>.
- Suprpto, M., Bakker, H.L.M., Mooi, H.G. and Moree, W. (2015b) 'Sorting out the essence of owner-contractor collaboration in capital project delivery', *International Journal of Project Management*, Vol. 33, No. 3, pp.664–683 [online] <https://doi.org/10.1016/j.ijproman.2014.05.001>.
- Teerikangas, S. and Gerdali, J. (2015) 'Integration in the study of organizations – a lack of integration?', *Symposium Organised 75th Annual Meeting of the Academy of Management*, pp.1–5.
- Turkulainen, V. and Ketokivi, M. (2012) 'Cross-functional integration and performance: what are the real benefits?', *International Journal of Operations & Production Management*, Vol. 32, No. 4, pp.447–767 [online] <https://doi.org/10.1108/09574090910954864>.
- Turkulainen, V., Kujala, J., Artto, K. and Levitt, R.E. (2013) 'Organizing in the context of global project-based firm – the case of sales-operations interface', *Industrial Marketing Management*, Vol. 42, No. 2, pp.223–233 [online] <https://doi.org/10.1016/j.indmarman.2012.08.004>.
- Turkulainen, V., Ruuska, I., Brady, T. and Artto, K. (2015) 'Managing project-to-project and project-to-organization interfaces in programs: organizational integration in a global operations expansion program', *International Journal of Project Management*, Vol. 33, No. 4, pp.816–827 [online] <https://doi.org/10.1016/j.ijproman.2014.10.008>.
- Vanhoucke, M. (2012) 'Measuring the efficiency of project control using fictitious and empirical project data', *International Journal of Project Management*, Vol. 30, No. 2, pp.252–263 [online] <https://doi.org/10.1016/j.ijproman.2011.05.006>.
- Wagner, H., Pankratz, O., Mellis, W. and Basten, D. (2017) 'Effort of EAI projects: a repertory grid investigation of influencing factors', *Project Management Journal*, Vol. 46, No. 5, pp.62–80 [online] <https://doi.org/10.1002/pmj.21523>.
- Wang, Y., Yang, J. and Shen, Q. (2007) 'The application of electronic commerce and information integration in the construction industry', *International Journal of Project Management*, Vol. 25, pp.158–163 [online] <https://doi.org/10.1016/j.ijproman.2006.09.008>.

- Wikström, K., Arto, K., Kujala, J. and Söderlund, J. (2010) 'Business models in project business', *International Journal of Project Management*, Vol. 28, No. 8, pp.832–841 [online] <https://doi.org/10.1016/j.ijproman.2010.07.001>.
- Yang, L., O'Connor, J.T. and Wang, C. (2006) 'Technology utilization on different sizes of projects and associated impacts on composite project success', *International Journal of Project Management*, Vol. 24, pp.96–105 [online] <https://doi.org/10.1016/j.ijproman.2005.06.008>.
- Yeo, K.T., Ren, Y. and Ren, Y. (2016) 'Risk management maturity in large complex rail projects: a case study', *International Journal of Project Organization and Management*, Vol. 8, No. 4, pp.301–323.
- Zerjav, V. (2015) 'Design boundary dynamics in infrastructure projects: issues of resource allocation, path dependency and problem-solving', *International Journal of Project Management*, Vol. 33, No. 8, pp.1768–1779 [online] <https://doi.org/10.1016/j.ijproman.2015.09.009>.
- Zou, W., Kumaraswamy, M., Chung, J. and Wong, J. (2014) 'Identifying the critical success factors for relationship management in PPP projects', *International Journal of Project Management*, Vol. 32, No. 2, pp.265–274 [online] <https://doi.org/10.1016/j.ijproman.2013.05.004>.
- Zuo, K., Potangaroa, R., Wilkinson, S. and Rotimi, J.O.B. (2009) 'A project management perspective in achieving a sustainable supply chain for timber procurement in Banda Aceh, Indonesia', *International Journal of Managing Projects in Business*, Vol. 2, No. 3, pp.386–400.