PERSPECTIVES ON PROJECT MANAGEMENT AND ASSET MANAGEMENT INTEGRATION: A SYSTEMATIC REVIEW

Andrea Gonzales Lazo[1], Mustafa Selçuk Çidik[2], Simon Addyman[3] and Iain Rillie[4]

[1,2&3] The Bartlett School of Sustainable Construction, University College London, 1-19. Torrington Place, London, London, WC1E 7HB, UK

[4] Health Safety and Wellbeing Division, National Highways, Bridge House 1 Walnut Tree Close, Guildford, GU1 4LZ, UK

Infrastructure development often treats project management (planning, design, and construction phases) and asset management (operation and maintenance phases) as separate silos, resulting in significant integration gaps. This systematic literature review explores how existing research connects these domains to promote lifecycle integration. Findings reveal that cost and risk management are essential for forecasting and decision-making, but their effectiveness is enhanced when combined with digital tools and collaborative procurement strategies. Additionally, stakeholder collaboration and effective information management are critical for overcoming organisational silos and ensuring seamless integration. This research reveals that integrated lifecycle management can reduce inefficiencies, enhance decision-making, and improve the long-term sustainability of infrastructure projects. By synthesising diverse insights, the study highlights the potential synergies between different lifecycle phases, emphasising better integration between project and asset management. These findings provide strategies for policymakers, practitioners, and researchers, helping to ensure long-term infrastructure project success and sustainability.

Keywords: asset management; infrastructure; life cycle integration; project management; system thinking

INTRODUCTION

In infrastructure development, there is still a significant gap in the effective linkage between project management (PM) and asset management (AM), despite progress in both areas (Larsson and Larsson 2020; Lenferink *et al.,* 2013). Often, the operation and maintenance (O&M) phases are not adequately integrated with the earlier phases of planning, design, and construction, which is crucial for sustainable, efficient, and comprehensive infrastructure lifecycle management. This disconnect typically arises from the separation of projects and operations into distinct organisational silos, leading to inefficiencies and limiting the potential for holistic asset lifecycle management (Brunet *et al.,* 2019; Zerjav *et al.,* 2018).

[1] andrea.lazo.17@ucl.ac.uk

Lazo, A G, Çidik, M S, Addyman, S and Rillie, I (2024) Perspectives on Project Management and Asset Management Integration: A Systematic Review *In:* Thomson, C and Neilson, C J (Eds) *Proceedings of the 40th Annual ARCOM Conference,* 2-4 September 2024, London, UK, Association of Researchers in Construction Management, 423-432.

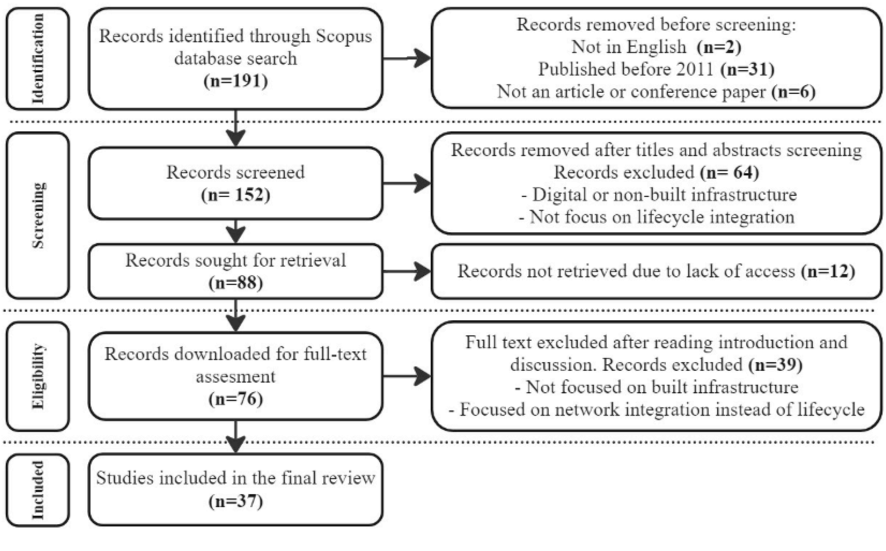
Historically, PM and AM have evolved in parallel, each with distinct methodologies and focus areas. The increasing complexity and scale of infrastructure projects highlight this separation as a bottleneck, obstructing the seamless transition of knowledge and practices across different lifecycle phases (Lenferink *et al.,* 2008; Ochieng *et al.,* 2017). PM traditionally focuses on the delivery phases—Definition, Execution, Closeout—as outlined in the PMBOK Guide and expanded by Morris (2013) to include the front-end as essential for the 'management of projects'. In contrast, AM, as defined by Too (2010) and supported by ISO 55000 (Hastings 2015), offers a broader lifecycle perspective that includes planning, creation, and maintenance. Following Madhusanka *et al.,* (2020), this review examines the lifecycle of infrastructure projects through the PM phases of Planning, Design, and Construction, and the AM phases of Operations, Maintenance.

This systematic literature review (SLR) explores diverse approaches to connect both ends, addressing a research gap already recognised in the literature (Kumaraswamy 2011; Sebastian *et al.,* 2023; Wong *et al.,* 2014). To structure the analysis, key themes were identified from the literature, focused on different perspectives of lifecycle integration. By synthesising insights across these themes, the SLR aimed to deepen the understanding of interdependencies between infrastructure lifecycle phases as well as highlight the research trends, gaps, and potential synergies for enabling better lifecycle integration.

METHOD

This study employed a SLR to explore the integration of O&M phases with planning, design, and construction stages in built infrastructure projects. An SLR offered a reproducible, scientific, and transparent method to examine literature by following a predefined protocol for searching, selecting, assessing, and synthesising evidence to answer specific research questions (Boell and Cecez-Kecmanovic 2015; Kitchenham 2014). The research question guiding this study was: "How are the phases of O&M effectively integrated with planning, design, and construction in built infrastructure projects?"

Figure 1: PRISMA flow diagram for SLR



The literature search was conducted using the Scopus database, selected for its comprehensive coverage of peer-reviewed journals (Norris and Oppenheim 2007). The search strategy included three keyword clusters focusing on management practices, infrastructure projects, and lifecycle phase integration. The search query string used was “ TITLE-ABS-KEY ("knowledge management" OR "project* management" OR "infrastructure management" OR "asset* management" OR "management of knowledge" OR "management of project*" OR "management of infrastructure*") AND TITLE-ABS-KEY ("infrastructure* planning" OR "infrastructure development" OR "infrastructure project*" OR "built asset*" OR "physical asset*" OR "infrastructure asset*") AND TITLE-ABS-KEY ("life*cycle*" OR "integrating infrastructure*" OR "integrated infrastructure*" OR "collaborative integration*" OR "whole*life" OR "collaborative practice*" OR "Feedback loop*" OR "Holistic approach*")

The initial search yielded 191 articles. The PRISMA diagram (Figure 1) shows the selection process, refining the initial 191 articles to 37 studies included in the final review. Inclusion criteria were articles and conference papers discussing the management of physical infrastructure assets and addressing the integration of O&M with planning, design, and construction. Exclusion criteria included books, book chapters, studies on digital or non-built infrastructure, studies focusing on integration between different types of infrastructure without addressing lifecycle analysis, and articles focusing solely on lifecycle analysis without addressing phase integration.

Data extraction and analysis were systematically conducted using Microsoft Excel. Based on a keyword analysis count that identified recurring themes and concepts in the literature, articles were categorised into five perspectives on integration. The Information perspective is strongly linked to digital tools. The Risk and Finance perspective is mainly concerned with models for forecasting costs and risks over the entire life cycle. The Operational perspective focuses on seamless integration with existing systems. The Collaboration perspective emphasizes stakeholder interaction and the impact of procurement on cooperation. The Resilience perspective addresses the enhancement of long-term durability and sustainability of infrastructure.

FINDINGS AND DISCUSSION

By examining the different approaches to integrating the AM and PM phases of infrastructure projects, the findings show that these approaches can be grouped into five perspectives. These perspectives highlight different lenses for viewing and managing lifecycle integration and emphasize the overlaps and interdependencies that require multidisciplinary approaches. Due to space limitations, this section may not cover all the nuances and related discussions from the full range of literature reviewed.

Information Perspective

The focus of this perspective is on the strategies to make data accessible to all require parties involved in the infrastructure lifecycle, enhancing information flow and decision-making across different infrastructure project phases. This includes exploring the digital tools required and the challenges that this interaction presents, especially when information need to be shared across PM and AM domains. (See Table 2)

Building Information Modelling (BIM) technologies have significantly improved the planning, design, and construction phases of infrastructure projects, offering enhanced performance, analysis, control, and scheduling (Chen and Jupp, 2018). However, extending these benefits into the O&M phases remains limited, revealing a gap in the information flow and interoperability required by AM (Abideen *et al.,* 2022; Brunet *et* *al.,* 2019). Achieving a unified data management system, or "Single Version of the Truth," is essential but challenging due to varying data formats and software applications across PM and AM domains (Booth, 2012; Jiang *et al.,* 2022).

Interoperability issues lead to significant time and financial losses during data transfer and adaptation (Abideen *et al.,* 2022). To address these challenges, open standards like IFC are crucial for improving data sharing and compatibility, but they require further development to fully support infrastructure projects (Floros *et al.,* 2019). Emerging technologies such as digital twins and crowdsourcing systems can enhance decision-making and asset management but introduce complexities related to IT infrastructure and data security (Tchana *et al.,* 2019; Ng *et al.,* 2018). Additionally, Haider (2011) highlights the disconnect between IT systems, which enable individual processes but fail to integrate lifecycle management activities, emphasising the importance of organisational behaviour in implementing IT solutions successfully.

Table 2: Information perspective key findings

Topic	Key findings	Source
Adoption of BIM	Revolutionised the planning, design, and construction but limited extension into O&M phases. Loss of data in transfer and adaptation	Chen and Jupp 2018; Abideen *et al.,* 2022; Brunet *et al.,* 2019;
Single version of the truth	Interoperability and unified data management are crucial to mitigate time and financial losses.	Booth 2012; Jiang *et al.,* 2022;
Open Standards - Open software	Importance of Industry Foundation Classes (IFC), compatibility between BIM, GIS and AI and challenges with infrastructure elements	Sebastian *et al.,* 2023; Floros *et al.,* 2019
Digital Twins and crowdsourcing	New technologies for collaborative lifecycle data management. Potential benefits and challenges, including IT complexity and data security	Tchana *et al.,* 2019; Ng *et al.,* 2018

Therefore, while digital technologies like BIM have advanced PM, their integration into AM through effective information management and interoperability remains a critical frontier. Emphasising both technological innovation and organisational adaptation is essential to ensure these tools enhance the entire lifecycle of infrastructure projects, leading to improved efficiency and sustainability.

Risk and Finance Perspective

This perspective focuses on investment decisions and long-term strategic planning, where accurate financial forecasting and effective risk management are fundamental to the performance of infrastructure projects (Morris, 2013). While all articles in the SLR mention cost and risk, this section examines those that offer integration by providing insights into dynamic feedback mechanisms and strategies to improve decision-making related to cost and risk. The key findings are described in Table 3.

Lifecycle cost (LLC) financial models provide predictive capabilities, integrating performance and cost models for financial sustainability (Elcheikh and Burrow, 2017; Rama and Andrews, 2016). However, these models often lack feedback mechanisms to incorporate insights from operational phases or past projects to refine future planning and execution (Rehan *et al.,* 2011, 2014). Dynamic and iterative approaches, such as iterative learning and feedback loops, can help refine and adapt cost estimations and risk assessments to changing conditions (Zandvoort *et al.,* 2019; Rehan *et al.,* 2011, 2014), yet their practical application seems hindered by data availability and the cultural inertia of siloed operations (Leitch and Ellsworth 2016).

Strategic risk management and investment that considers long-term O&M implications allow for better prediction and mitigation of potential risks, contributing to more robust financial planning. Nasution and Suriandari (2021) found that for optimal financial outcomes, the highest priority for risk management is due during the operational phase, as it requires the most resources, while Leitch and Ellsworth (2016) aim to improve investment decisions by prioritising the maintenance of critical assets.

Table 3: Information perspective key findings

Topic	Key findings	Source
Lifecycle cost analysis (LLC)	Frameworks for LLC analysis integrating performance and cost models, including replacement and uncertainty considerations. Proactive maintenance strategies.	Elcheikh and Burrow 2017; Rama and Andrews 2016; Zandvoort *et al.,* 2019; Henjewele *et al.,* 2011;
Dynamic and iterative approaches	Dynamic feedback loops mechanisms. Iterative and proactive risk management. Value for money models that are dynamic	Zandvoort *et al.,* 2019; Rehan *et al.,* 2011, 2014 Henjewele *et al.,* 2011
Risk and Strategic management	Strategic risk management and investment frameworks. Long-term O&M considerations into planning and resource allocation.	Nasution and Suriandari, 2021; Leitch and Ellsworth 2016

The literature shows that while many articles develop mathematical models to predict lifecycle costs and risks, these static approaches often fall short of fostering true integration if dynamic and adaptive strategies are not also considered. While the importance of risk management and cost estimation is widely recognised, the challenge is to move beyond traditional frameworks to develop practices that forecast costs, assess risks, and adapt to the evolving landscape of infrastructure projects. Developing these integrated strategies remains a ripe area for innovation, which is essential to ensure the long-term success and resilience of infrastructure projects.

Operational Perspective

This perspective focuses on ensuring that planned and constructed infrastructure projects integrate operationally with existing systems. It explores systems engineering (SE) principles, dynamic feedback mechanisms, and interoperability in data management to achieve operational readiness, all critical for successful project delivery and asset management. See key finding in Table 4.

The SLR provides insights into the application of SE principles, emphasising requirement management and systematic verification through approaches like the V-model (Chen and Jupp 2018; Mabelo and Sunjka 2017). This shows that project information is well organised and accurate, addressing the critical challenge of interoperability in the information systems. Maintaining a single source of truth is central to keeping data consistent and reliable from the planning stage through to operations (Jiang *et al.,* 2022; Knott *et al.,* 2014). Furthermore, dynamic feedback mechanisms and causal loops facilitate continuous improvement and adaptation by connecting various project phases and enabling iterative learning (Rehan *et al.,* 2011, 2014; Zandvoort *et al.,* 2019). These mechanisms ensure that projects can respond effectively to changing conditions, thus supporting dynamic and resilient infrastructure management strategies.

Operational readiness is another critical aspect highlighted in the literature. While Knott *et al.,* (2014) focus on achieving operational readiness through the integration of information of various systems, Zerjav *et al.,* (2018) examine how project capabilities enable firms to deliver operational outcomes in infrastructure projects. They emphasize the importance of establishing an operational readiness team well before project completion to ensure a seamless transition to operational phases, integrating key operational insights early in the project lifecycle.

Table 4: Operational perspective key findings

Topic	Key findings	Source
System Engineering (SE)	Emphasising requirement management, system dynamics, use of V-model for verification and validation.	Chen and Jupp 2018; Mabelo and Sunjka 2017; Knott *et al.,* 2014
Interoperability	Use of digital tools to overcome silos among information systems, aiming for a single source of truth	Jiang *et al.,* 2022 Knott *et al.,* 2014
Feedback loops in lifecycle management	Lifecycle management with a 'double loop' learning process, facilitating continuous improvement.	Rehan *et al.,* 2011, 2014; Zandvoort *et al.,* 2019
Operational Readiness (OR)	Project capabilities for OR, operational consideration embedded into the design process. Integrating various information system for OR.	Zerjav *et al.,* 2018 Knott *et al.,* 2014

The synergy between the operational and information perspectives aims to establish a single source of truth throughout the project lifecycle. Using a systems approach promotes a seamless flow of accurate information across all project phases and supports dynamic management frameworks. This is critical for integrating AM and PM focusing on the whole of the system rather than isolated parts. By fostering strategic decision-making and using real-time data and user feedback, this approach enhances project delivery, operational readiness, and long-term sustainability.

Collaboration Perspective

This section underscores the need for cooperation in infrastructure projects addressing both the people-oriented aspect of stakeholder engagement and the legal frameworks of collaborative contracts and procurement strategies. Articles in this perspective discuss how these collaborative approaches enhance project outcomes and facilitate effective integration of PM and AM (Table 5).

The literature highlights the importance of prioritising stakeholder interests and project adaptability through transparency, and shared objectives by early incorporation of AM considerations. Collaborative contracts, characterised by ongoing communication and collective decision-making, facilitate mutual understanding among all parties (Henjewele *et al.,* 2011; Ng *et al.,* 2018). Wu and Xue (2013) show how CoP enhance stakeholder collaboration across teams, aligning project goals with stakeholder expectations and fostering a cohesive management strategy.

Flexible procurement strategies, such as DBFM contracts (Lenferink *et al.,* 2013, 2014) balance contractual flexibility with structured stakeholder engagement, addressing political risks and ensuring the effective involvement of all relevant parties However, effective collaboration depends not only on the contracts but also on their synergy with collaborative technologies. Brunet *et al.,* (2019) and Ibrahim (2013) highlight the impact of procurement arrangements on integrating AM teams from the project's inception, stressing the need for a holistic approach that combines technological capabilities with contractual provisions for data access.

The synergy between contracts and digital technologies underscores the necessity for integrated management frameworks that adapt to the complexities of modern infrastructure projects. Digital technologies must facilitate collaboration and data sharing, while contracts must ensure data accessibility for all relevant parties. This integration supports strategic decision-making and enhances the overall efficiency and effectiveness of project delivery and asset management.

Table 5: Collaboration perspective key findings

Topic	Key findings	Source
Collaborative Contract Approaches	Emphasize transparency, shared goals, and early AM integration. Use of collaborative platforms.	Henjewele *et al.,* 2011; Ng *et al.,* 2018
Stakeholder Engagement	Early stakeholder involvement. Collective decision-making. Communities of practices (CoP) for collaboration across teams	Larsson and Larsson 2020; Zerjav *et al.,* 2018; Wu and Xue 2013
Flexible Procurement Strategies	DBFM contracts to enhance integration. Stakeholder collaboration embedded in contracts.	Lenferink *et al.,* 2013, 2014; Bisbey *et al.,* 2020

Resilience Perspective

This perspective focuses on enhancing the long-term durability and sustainability of infrastructure projects addressing strategies for making infrastructure resilient to environmental changes, disasters, and other unforeseen events in the whole lifecycle. Articles in this section discuss various angles, including sustainability integration, risk management, and adaptive frameworks.

Integrating sustainability into all phases of infrastructure projects ensures they contribute to economic, social, and environmental sustainability, maintaining functionality and resilience in the face of uncertainties (Bisbey *et al.,* 2020; Larsson and Larsson, 2020). Risk management strategies are essential for anticipating and mitigating disruptions, enhancing infrastructure robustness by identifying threats and developing proactive plans (Fritz and Bradford, 2019; Ng *et al.,* 2018). Adaptive frameworks allow infrastructure to respond to and recover from changes and disruptions, supporting iterative learning and continuous improvement (Lenferink *et al.,* 2013; Yang *et al.,* 2019).

The synergy between sustainability, risk management, and adaptive frameworks is crucial for building resilient infrastructure. By integrating these elements, projects can achieve long-term durability and sustainability, ensuring they remain functional and effective despite future challenges. While integrating sustainability and resilience with asset and project management is conceptually sound, the literature often lacks in-depth strategies for practical implementation and outcome evaluation (Fritz and Bradford, 2019). This gap highlights the need for future research to explore effective incorporation of these principles into AM and PM practices, ultimately leading to infrastructure that is robust, sustainable, and flexible enough to meet future challenges.

CONCLUSIONS

The SLR shows the need for a multidisciplinary approach to effectively integrate PM and AM in infrastructure projects. Each perspective- Information, Risk and Finance, Operational, Collaboration and Resilience - provides unique insights and strategies for lifecycle integration, highlighting that no single discipline can achieve full integration without combined efforts and an integrated management approach.

The findings show synergies between the perspectives. While most of the articles reviewed under the information perspective emphasize the role of digital tools and data accessibility, many also recognise that technology alone is not sufficient without the collaboration of all project stakeholders, supported by legal frameworks and collaborative contracts that encourage collaborative efforts from the outset. Digital tools require that people have the right to access data from different stages, and effective collaboration is critical to overcoming organisational silos and ensuring that AM considerations are integrated early in the project lifecycle.

The operational perspective ensures that projects are designed for operational readiness from the planning stage. This approach promotes seamless integration with existing systems and continuous improvement through feedback loops. Similarly, the risk and finance perspective recognise the need to incorporate dynamic feedback mechanisms into decision making to achieve effective long-term financial planning. These strategies need to be supported by robust information systems and stakeholder engagement to proactively manage risks and adapt to changing conditions. This will ensure that sustainability is built into all project phases and that the infrastructure is adaptable to future challenges.

Recognising the broader timeline of the infrastructure project lifecycle is critical. Each phase of infrastructure development is interconnected and requires that each perspective contributes to a unified system. This interconnectedness supports full lifecycle integration and promotes long-term sustainability and operational readiness. The SLR identifies a gap in empirical research on the practical implementation of these integrated strategies, particularly in bridging the qualitative focus of PM with the quantitative nature of AM, which emphasizes continuous monitoring and improvement. Future research should explore how these multidisciplinary approaches can be effectively incorporated into real-world projects, considering evolving infrastructure needs and the dynamic context of digital innovation and climate change.

In conclusion, addressing the identified gaps and exploiting the synergies between different perspectives provides a roadmap for evolving infrastructure project management towards systems that are not only efficient and effective, but also resilient and sustainable for future challenges. Projects that consider the long-term view, including the needs of the asset management phases, can plan for them from the outset of the project. Further empirical exploration to validate these intersections and enrich the field with data-driven insights to ensure that infrastructure projects meet the complex demands of the future.

REFERENCES

Abideen, DK, Yunusa-Kaltungo, A, Manu, P and Cheung, C (2022) A systematic review of the extent to which BIM is integrated into operation and maintenance, *Sustainability*, **14**(14).

Bisbey, J, Hosseini Nourzad, S H, Chu, C Y and Ouhadi, M (2020) Enhancing the efficiency of infrastructure projects to improve access to finance, *Journal of Infrastructure, Policy and Development*, **4**(1), 27-49.

Boell, S K and Cecez-Kecmanovic, D (2015) On being ‘systematic’ in literature reviews in IS, *Journal of Information Technology*, **30**(2), 161-173.

Booth, R J (2012) Information architectures to improve lifecycle value, including lessons from integrated logistics support, *Iet Conference Publications*, **2012**(609 CP), 1-6.

Brunet, M, Motamedi, A, Guénette, L M and Forgues, D (2019) Analysis of BIM use for asset management in three public organisations in Québec, *Canada Built Environment Project and Asset Management*, **9**(1), 153-167.

Chen, Y and Jupp, J (2018) Model-based systems engineering and through-life information management in complex construction, *In*: *IFIP Advances in Information and Communication Technology*. **540**.

Floros, G S, Boyes, G, Owens, D and Ellul, C (2019) Developing IFC for infrastructure: A case study of three highway entities, *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, **4**(4/W8), 59-66.

Fritz, A and Bradford, E (2019) Breaking down silos: Trends in resilient and sustainable, In: *Infrastructure Planning International Conference on Sustainable Infrastructure 2019*, 254-262.

Hastings, N A J (2015) *Physical Asset Management: with an Introduction to ISO55000*, Cham: Springer International Publishing.

Henjewele, C, Sun, M and Fewings, P (2011) Value for money optimisation and sustainability in PFI projects. *In:* Egbu, C and Lou, E C W (Eds.), *Proceedings 27th Annual ARCOM Conference*, 5-7 September 2011, Bristol, UK. Association of Researchers in Construction Management, 65–74.

Ibrahim, N H (2013) Reviewing the evidence: USE of digital collaboration technologies in major building and infrastructure projects, *Journal of Information Technology in Construction*, **18**(February), 40-63.

Jiang, J, Henning, T F P and Zou, Y (2022) Multiple system integration in local government asset management: A New Zealand case study, *IOP Conference Series: Earth and Environmental Science*, **1101**(9).

Kitchenham, B (2014) *Procedures for Performing Systematic Reviews*, Keele University Technical Report, **33**(2004), 1-26.

Knott, A, Hack, M and Cope, A (2014) Delivering a light rail system into service - Considerations for effective asset management, *IET Conference Publications*, **642**.

Kumaraswamy, M (2011) Editorial: Integrating infrastructure project management with its built asset management, *Built Environment Project and Asset Management*, **1**(1), 5-13.

Larsson, J and Larsson, L (2020) Integration, application and importance of collaboration in sustainable project management, *Sustainabilit*y, **12**(2).

Leitch, R B and Ellsworth, D E (2016) Implementing asset management for the U.S Army Corps of Engineers Civil Works, IET Conference Publications, **710**, 1-9.

Lenferink, S, Tillema, T and Arts, J (2008) *The Potential of a Life-Cycle Approach for Improving Road Infrastructure Planning in the Netherlands Bijdrage*, Aan Het Colloquium Vervoersplanologisch Speruwerk, 7823-7830.

Lenferink, S, Tillema, T and Arts, J (2013) Towards sustainable infrastructure development through integrated contracts: Experiences with inclusiveness in Dutch infrastructure projects, *International Journal of Project Management*, **31**(4), 615-627.

Lenferink, S, Tillema, T and Arts, J (2014) Lifecycle driven planning of infrastructure: Public and private experiences with more integrated approaches for managing project complexity, *European Journal of Transport and Infrastructure Research*, **14**(2), 82-101.

Mabelo, P B and Sunjka, B P (2017) Application of systems engineering concepts to enhance project lifecycle methodologies, *South African Journal of Industrial Engineering*, **28**(3SpecialEdition), 40-55.

Madhusanka, N, Kumaraswamy, M, Pan, W and Chan, S Y (2020) Relationally integrated value networks for total asset management in project portfolios, *Infrastructure Asset Management*, **9**(3), 123-134.

Morris, P W G (2013) *Reconstructing Project Management*, Chichester: John Wiley and Sons Ltd.

Nasution, S M I and Surjandari, I (2021) Phase priority in physical assets management: A case study of pressure vessel in petroleum industry, *In*: *ACM International Conference Proceeding Series*, 493-498.

Ng, S T, Xu, F J, Yang, Y, Li, H and Li, J (2018) A social networking enabled crowdsourcing system for integrated infrastructure asset management, *Construction Research Congress 2018*, 322.

Norris, M and Oppenheim, C (2007) Comparing alternatives to the Web of Science for coverage of the social sciences' literature, *Journal of Informatics*, **1**(2), 161-169.

Ochieng, E, Price, A and Moore, D (2017) *Major Infrastructure Projects: Planning for Delivery*, *London: Bloomsbury Publishing*.

Rama, D and Andrews, J D (2016) Railway infrastructure asset management: The whole-system life cost analysis, *IET Intelligent Transport Systems*, **10**(1), 58-64.

Rehan, R, Knight, M A, Haas, C T and Unger, A J A (2011) Application of system dynamics for developing financially self-sustaining management policies for water and wastewater systems, *Water Research*, **45**(16), 4737-4750.

Rehan, R, Knight, M A, Unger, A J A and Haas, C T (2014) Financially sustainable management strategies for urban wastewater collection infrastructure - development of a system dynamics model, *Tunnelling and Underground Space Technology*, **39**, 116-129.

Sebastian, R, Weise, M, Mitsch, N, Giurgiu, I and Rodríguez, A S (2023) Towards European standardisation of digitalisation approaches for monitoring and safety of bridges and tunnels, *In*: *Proceedings of the 14th European Conference on Product and Process Modelling*, ECPPM 2022, 204-209.

Tchana, Y, Ducellier, G and Remy, S (2019) Designing a unique Digital Twin for linear infrastructures lifecycle management, *Procedia CIRP*, **84**(March), 545-549.

Too, E G (2010) A framework for strategic infrastructure asset management, *Engineering Asset Management Review*, **1**.

Wong, K K W, Kumaraswamy, M, Mahesh, G and Ling, F Y Y (2014) Building integrated project and asset management teams for sustainable built infrastructure development, *Journal of Facilities Management*, **12**(3), 187-210.

Wu, D and Xue, X (2013) Adopting a community of practice in infrastructure project management, *In*: *ICCREM 2013: Construction and Operation in the Context of Sustainability*, 1342-1351.

Xu, J and Wu, Y (2023) Organising occupational health, safety and well-being in construction: Working to rule or working towards well-being? *In*: S Addyman and H Smyth (Eds.) *Construction Project Organising*, London: Whiley and Sons, 17-30.

Yang, Y, Ng, S, Zhou, S, Xu, F J and Li, H (2019) A physics-based framework for analysing the resilience of interdependent civil infrastructure systems: A climatic extreme event case in Hong Kong, *Sustainable Cities and Society*, **47**(February), 101485.

Zandvoort, M, van der Vlist, M J, Haitsma, R and Oosterveld, E (2019) Lifecycle management and replacement strategies: Two of a kind? Life-cycle analysis and assessment in civil engineering: Towards an integrated vision, *In*: *Proceedings of the 6th International Symposium on Life-Cycle Civil Engineering, IALCCE 2018*, 1507-1512.

Zerjav, V, Edkins, A and Davies, A (2018) Project capabilities for operational outcomes in inter-organisational settings: The case of London Heathrow Terminal 2, *International Journal of Project Management*, **36**(3), 444-459.