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Addressing Change Order Management Challenges through the Last Planner System in Rail Construction Projects

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ABSTRACT

The construction industry plays an important role in national development by supporting economic growth, especially through large-scale projects such as rail construction. However, rail projects are highly complex and frequently involve change orders (COs), which may result in delays, cost overruns, and administrative challenges if not managed properly. This study examines the key challenges in Change Order Management (COM) practices in Malaysian rail construction projects across the COM framework. A qualitative approach was adopted using semi-structured interviews with eight industry professionals from organisations identified through the Malaysian Rail Supporting Industry Roadmap 2030 (MIGHT). Purposive and snowball sampling techniques were employed to obtain relevant respondents with experience in rail construction projects. The findings identified 15 key challenges across the three phases of the COM framework. Building on these findings, the study analyses how the identified COM challenges can be addressed through specific elements of the Last Planner System (LPS). The analysis focuses on Master Planning, Phase Planning, Lookahead Planning, Weekly Work Plan, and Measure and Learning to explore their potential in improving current COM practices. This study provides practical insights into strengthening COM implementation in Malaysian rail construction projects.

Keywords: Rail construction; change order management; Last Planner System (LPS)

INTRODUCTION

The construction industry is a very significant contributor to economic growth in countries, particularly by constructing infrastructure projects, such as rail projects. Rail projects form as a part of our transport system and are very significant, but may be quite complex and require the involvement of many parties, different materials as well as technologies (Alsehaimi et al. 2014).

In rail projects, one of the major issues is controlling changes occurring after work has begun. These change orders may impact the project's schedule, budget and overall success leading to disruption in people's satisfaction (Limenih et al, 2022). However, the process of managing such changes is not an easy one and involves viewing, approving, as well as monitoring the modifications made on the original plan (Senouci et al. 2017).

Change orders are not trivial matters; they are a major indicator of the success or failure of construction projects. An inappropriate handling of change orders affects the project time, financial resources and quality. Therefore, change-order management is the most important aspect of project control during rail construction projects. Poorly managed change orders can result in expensive disputes,

project delays and dissatisfied stakeholders (Naji, Gunduz & Naser 2022). The need for effective change-order management cannot be emphasized enough, for it will determine whether rail systems are reliable or not, whether the public is safe or unsafe and how stable the future economy will be.

A potential solution to manage change orders in the unique context of rail construction projects is by using the Last Planner System (LPS). LPS helps to plan and manage the construction process, by improving communication between all parties involved in construction and minimizing unforeseen challenges or issues during the construction. LPS also has proven useful in other construction projects, however it has not been used much in rail constructions, particularly in managing change orders (Belayutham, Mohamad Jaafar, Ismail & Che Ibrahim 2022).

In this case, the project managers really stand out as the central role in the change order management, since they are the ones who will be managing the project right from the beginning to the end. Therefore, this study can be really helpful for project managers because the Last Planner System (LPS) can help in smoothen their work by involving all stakeholders in the progress, thus can foster good communication among them, and give flexibility of the project. The Last Planner System (LPS) is also good in monitoring the project progress and giving regular updates, so it is helpful to maintain the high-quality of the project.

LITERATURE REVIEW

This part initiates with an exploration of the Malaysian rail industry, then focuses on change order management and its impact on rail construction project performance. Subsequently presents information about LPS as an approach to change order management. The ensuing discussions encompass an exploration of challenges in LPS implementation. The overview then leads up to presenting the conceptual framework governing this study.

THE RAIL INDUSTRY IN MALAYSIA

The railway sector in Malaysia has significantly contributed to the country's growth by enhancing connectivity and stimulating activities through government investments in rail projects (Yusoff, Ng & Azizan 2021). Singapore's MRT system, known for its reliability and advanced technologies, has influenced Malaysia's rail projects by introducing new approaches to reliability and innovation. Similarly, China's extensive high-speed rail network and Maglev trains have set a benchmark for Malaysia in adopting advanced technologies and improving regional connectivity (Liu, Yang, Chen, Zhang & Zhou 2023; L.L. Liu 2023).

Malaysia's involvement in the One Belt One Road (OBOR) project has attracted significant investments in rail infrastructure, such as the East Coast Rail Link (ECRL) and the Kuala Lumpur-Singapore High-Speed Rail (HSR) projects, fostering interconnectivity and economic growth (Abdullah et al. 2023). However, managing these projects is complex, with challenges in communication and coordination.

Major projects like high-speed rails and Transit-Oriented Development (TOD) in the Klang Valley demonstrate Malaysia's commitment to expanding its rail sector to meet rising demands (Sathiaseelan, Dava, & Mahmud 2020). Projects like the ECRL highlight the strategic vision to enhance economic development across regions (Zainuddin et al. 2022).

Overall, Malaysia's rail projects have introduced efficient and environmentally friendly transportation systems, significantly impacting the country's economy and urban development, and positioning Malaysia as a progressive nation in the global transport landscape.

CHANGE ORDER IN CONSTRUCTION PROJECTS

In construction projects, change orders (COs) involve modifications to the original project scope, design, or specifications after work has commenced (Khoso et al. 2019). These changes can arise inevitably due to design errors, unexpected site conditions, client requests, or regulatory requirements (Waty & Sulistio 2022). Effective COM is essential to minimize impacts on project timelines, budgets, and overall quality (Yap & Skitmore, 2018).

Change orders are typically managed through a structured process that can be grouped into three key phases (Ismaeil et al. 2024). The first phase, Start-Up, Identification & Evaluation, involves recognizing the change, assessing its feasibility, documenting the request, and evaluating its potential impact on scope, cost, and schedule. The second phase, Approval & Propagation, includes the formal review and approval of changes by stakeholders, ensuring that all affected parties are informed and necessary adjustments to plans, resources, and schedules are communicated. The third phase, Post-Change, focuses on implementing the approved changes, monitoring their impact, updating documentation, and resolving any disputes or issues that may arise as a result of the modification.

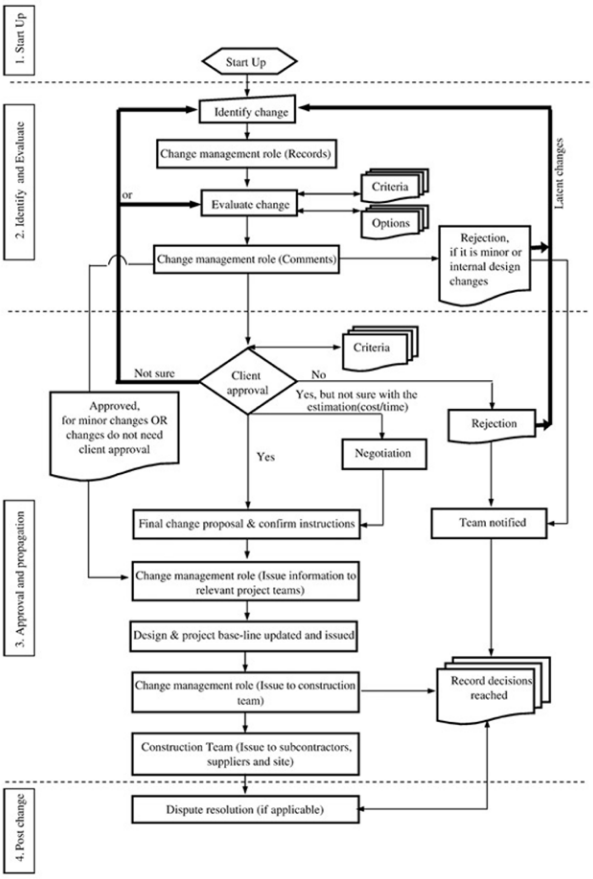

FIGURE 1. COM Framework (Ismaeil & Sobaih 2024)

Across these three phases, COM requires thorough documentation, systematic evaluation, and stakeholder collaboration to maintain project integrity. While the full COM framework comprises 11 steps, they can be consolidated into these three overarching phases such as shown in Figure 1, providing a clearer structure for understanding and managing change orders. Proper implementation of each phase is crucial to preventing delays, budget overruns, and disputes, ultimately supporting the successful completion of construction projects (Aslam et al. 2019; Nazrul et al. 2019).

LEAN CONSTRUCTION: THE LAST PLANNER SYSTEM (LPS)

The Last Planner System (LPS) is a lean construction method aimed at enhancing project planning, site management, and productivity. It improves workflow reliability and reduces waste by engaging all stakeholders in collaborative planning and continuous improvement (Belayutham et al. 2022)

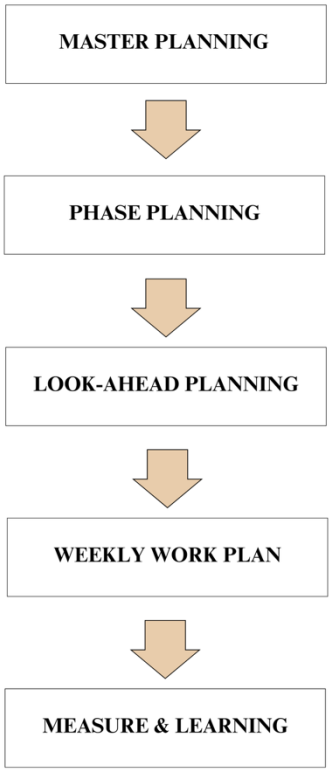

FIGURE 2. Last Planner System Elements

The LPS has five core elements such as shown in Figure 2, begins with Master Planning which involves defining project objectives, schedules, and constraints. Stakeholders establish the project scope, budget, quality requirements, and create a roadmap with key milestones.

Then Phase Planning, where work packages or phases are identified to organize the construction work. Collaborative planning sessions help outline dependencies, critical path activities, and create detailed plans for each phase, ensuring alignment with project objectives (Sbiti et al. 2021).

After that, Look-ahead Planning prioritizes tasks necessary for project continuity. This phase involves identifying dependencies, resource availability, and constraints to proactively manage project activities.

Next is the Weekly Work Plan, where weekly meetings are held to review progress, allocate duties, and address arising issues. These meetings enhance accountability and ensure adherence to project schedules. This phase allows for timely adjustments and alignment with project goals (Belayutham et al. 2022).

Finally, Measure and Learning focuses on performance measurement and continuous improvement. Key performance indicators, such as schedule adherence and

productivity metrics, are used to evaluate performance. Continuous monitoring and feedback loops help identify areas for improvement, optimizing future project execution (Limenih et al. 2022).

Challenges to LPS implementation include standardization issues, resistance to new technologies, and project complexities. Overcoming these requires collaborative partnering, leadership commitment, knowledge management, and innovative strategies to ensure successful adoption and enhanced project outcomes.

INTEGRATING LPS INTO CHANGE ORDER MANAGEMENT (COM)

This study begins by identifying the key challenges present in COM within rail construction projects. Following this, the study examines how the elements of the LPS (Master Planning, Phase Planning, Lookahead Planning, Weekly Work Plan, and Measure & Learning) can be applied to address the issues identified. Each LPS element provides different benefits for enhancing specific aspects of COM, such as shown in Table 1.

Master Planning supports the overall organization of the project by establishing clear objectives, timelines, and milestones, which helps to prevent scope ambiguity and reduce miscommunication during change order execution (Kortenko et al. 2021). Phase Planning allows the breakdown of work into manageable packages, enabling stakeholders to coordinate tasks effectively and align changes with the project's critical path (Fernandez et al. 2020). Lookahead Planning prioritizes upcoming activities, identifies potential constraints, and anticipates conflicts, which facilitates proactive management of change orders before they impact progress (Daniel et al. 2017). Weekly Work Plans create a platform for continuous stakeholder engagement, progress review, and timely adjustments, ensuring accountability and minimizing delays caused by uncoordinated changes (Sharma & Trivedi, 2021). Finally, Measure & Learning involves monitoring performance, evaluating outcomes, and documenting lessons learned, which provides feedback for improving future COM practices (Erazo-Rondinel et al. 2021)

By mapping each COM challenge to relevant LPS practices, the results can provide valuable insights to understand how lean planning tools can support more effective management of change orders.

TABLE 1. Key functions and contribution of Last Planner System to COM

LPS Element	Function	Contribution to COM	Reference
Master Planning	Establishes overall project objectives, timelines, and milestones	Reduce scope ambiguity Improve communication	Belayutham et al. 2022, Kortenko et al. 2021
Phase Planning	Breaks work into manageable phases or packages	Coordinate tasks Align change orders with critical path	Sbiti et al. 2021, Fernandez et al. 2020
Lookahead Planning	Prioritizes upcoming tasks, identifies constraints, anticipates conflicts	Proactive management of COs Identify potential conflicts early	Daniel et al. 2017), Sharma & Trivedi, 2021
Weekly Work Plan	Weekly stakeholder meetings to review progress, allocate tasks, and address issues	Enhance accountability Minimize delays from uncoordinated changes	Belayutham et al. 2022, Sharma & Trivedi, 2021
Measure & Learning	Monitors performance, evaluates outcomes, documents lessons learned	Feedback for improving COM Optimize future project execution	Limenih et al. 2022, Erazo-Rondinel et al. 2021)

METHODOLOGY

This study adopts a qualitative research approach, using the established COM framework of three phases, inclusive of 11 procedures as the basis for inquiry. Qualitative methods are employed in this study to enable an in-depth exploration of industry practices, thereby uncovering issues that are often overlooked in the broader literature (Dursun, 2023). Furthermore, this study also adopts a deductive approach, as it grounded in existing COM framework, rather than aiming to generate a new theory (Pearse 2019).

The sampling frame for participants in this study was derived from the Malaysian Rail Supporting Industry Roadmap 2030 developed by the Malaysia Industry-Government Group for High Technology (MIGHT 2014) which identifies organizations that remain active and strategic to the national rail sector. These organizations include Rail Operators and Asset Owners, Design

Manufacturing & Assembly (DMA) firms, Maintenance, Repair & Overhaul (MRO) companies, and Support Services providers. Within these organizations, individuals were purposively selected based on two main criteria: (i) professional experience in rail project management, and (ii) direct involvement in the handling of CO processes. This study also employed snowball sampling to compliment the purposive selection process.

Figure 3 presented an overview of how the study was conducted. The interviews continued until data saturation was achieved, ensuring that responses were comprehensive and that no new significant themes emerged (Saunders et al. 2018). All audio recordings were transcribed verbatim to ensure accuracy and preserve the richness of participants' responses. The data were then analyzed using thematic analysis with NVivo15 software, through an iterative cycle of coding, constant comparison, and refinement of emerging categories. Initial codes were generated from the interview transcripts and progressively grouped into sub-themes and broader themes based on conceptual similarity and relevance to the research objectives.

FINDINGS

As illustrated in Figure 4, theme saturation was achieved by Interview 6, with no new themes appearing in Interviews 7 and 8, indicating strong stability. Data collection and analysis were conducted concurrently, where codes and categories were developed directly from the interview responses.

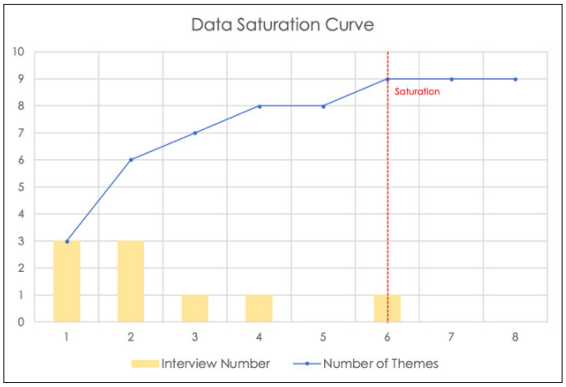

FIGURE 4. Data Saturation Curve

Based on interviews with eight industry professionals, a total of 15 key challenges were identified in COM practices for rail construction projects. These challenges were derived using a structured COM framework consisting of three main phases: Phase A (Start-Up, Identification and Evaluation), Phase B (Approval and Propagation), and Phase C (Post-Change), which collectively comprise 11 procedural steps. Respondents were guided to share their experiences based on this framework, allowing challenges to be captured across the entire COM process.

Following identification, the 15 challenges were systematically categorized according to the LPS elements most relevant for addressing them (Master Planning, Phase Planning, Lookahead Planning, Weekly Work Plan, and Measure and Learning). Each element represents a specific planning and control function that can support improvements in COM practices. Table 4 presents this categorization, which is further discussed in the subsequent sections.

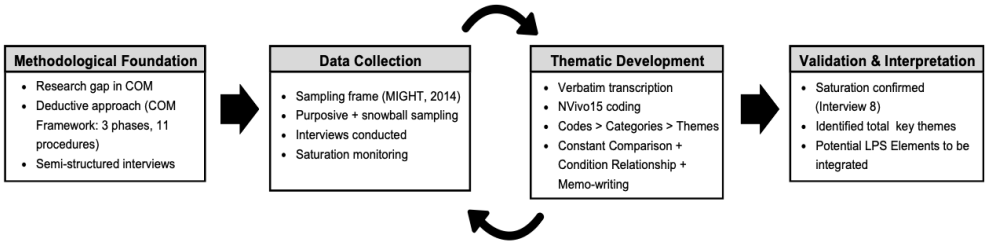

FIGURE 3. Overview of Qualitative Analysis Workflow

TABLE 2. Challenges in COM Framework

Identified COM Challenges	Relevant LPS Element
Incomplete or unclear documentation No clear criteria for cost/time/scope evaluation Disputes over scope or cost responsibility	Master Planning
Limited collaboration across teams Design and baseline updates not aligned Weak coordination between consultants, contractors and site	Phase Planning
Late identification of changes Last-minute instructions outside formal process	Lookahead Planning

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Unclear roles in managing changes Slow client approval Poor communication of approved changes Information not reaching subcontractors/suppliers on time Delayed resolution affecting project progress	Weekly Work Plan
Excessive paperwork in dispute resolution Lack of lessons learned for future projects	Measure & Learning

MASTER PLANNING

Challenges related to incomplete or unclear documentation, lack of clear criteria for cost, time, and scope evaluation, and disputes over scope or cost responsibility indicate weaknesses at the strategic planning level. These issues reflect that change orders are often initiated without a shared and well-defined project baseline, resulting in subjective interpretations and contested decisions. The absence of explicit evaluation criteria further weakens governance, allowing disputes to emerge when changes are implemented.

Therefore, Master Planning addresses these deficiencies by establishing clear project objectives, milestones, and constraints, which serve as a common reference for evaluating changes (Kortenko et al. 2021). By reducing scope ambiguity and improving communication at the outset, Master Planning limits misinterpretation and reduces the likelihood of disputes escalating during later COM phases.

PHASE PLANNING

Limited collaboration across teams, misalignment between design updates and project baselines, and weak coordination between consultants, contractors, and site teams reflect fragmentation within the COM process. These challenges indicate that change orders are often considered in isolation, without sufficient integration into existing work sequences.

Phase Planning mitigates this fragmentation by promoting collaborative planning across defined project phases (Fernandez et al. 2020). Through collective assessment of dependencies and sequencing, Phase Planning ensures that change orders are aligned with critical path activities, reducing disruption to ongoing construction works and improving coordination between design and site execution.

LOOKAHEAD PLANNING

Late identification of changes and the reliance on last-minute instructions outside formal procedures reflect a reactive approach in managing change orders. Such practices increase uncertainty, rework, and schedule disruption, suggesting that potential change-related risks are not adequately anticipated.

Lookahead Planning introduces a proactive mechanism by focusing on short-term forecasting, constraint identification, and early conflict detection (Daniel et al. 2017). By anticipating upcoming work and identifying readiness issues, Lookahead Planning enables changes to be assessed and integrated before execution, reducing reliance on last-minute instructions and improving control over change-related impacts.

WEEKLY WORK PLAN

A significant number of challenges were associated with the Weekly Work Plan stage, including unclear roles in managing changes, slow client approvals, poor communication of approved changes, delayed information flow to subcontractors and suppliers, and prolonged resolution affecting project progress. These challenges indicate weak accountability and ineffective information dissemination during change execution.

The Weekly Work Plan strengthens operational control by clarifying responsibilities, reviewing commitments, and providing a structured platform for coordination (Sharma & Trivedi, 2021). Regular meetings enable timely communication of approved changes, monitoring of pending approvals, and alignment between decision-makers and site-level teams, thereby minimizing delays caused by uncoordinated change implementation.

MEASURE & LEARNING

Post-change challenges, particularly excessive paperwork during dispute resolution and the lack of lessons learned, reflect a compliance-driven approach to COM rather than a learning-oriented one. The focus on documentation for claims suggests that knowledge gained from past changes is not systematically captured or reused.

The Measure & Learning element addresses this gap by emphasizing performance monitoring, feedback loops, and documentation of lessons learned (Erazo-Rondinel et

al. 2021). This shift enables organizations to move beyond reactive documentation towards continuous improvement, reducing the recurrence of similar COM issues in future rail projects.

IMPLICATIONS AND RECOMMENDATIONS

The findings could give significant implications to many parties.

The integration of LPS in COM can increase effectiveness in the use of public resources and improvements in the projects' performance, and it is useful especially to the policymakers. While for the practitioners, LPS provides an orderly way of handling rail projects to minimize conflicts while at the same time improving the satisfaction of the various stakeholders.

Future studies will be required to enhance the LPS framework and cross-verify it in other settings. Subsequent research should examine the use of LPS in other infrastructural projects and other regions. Investigations that assess the long-run consequences of LPS on project performance would be quite useful.

CONCLUSION

In conclusion, there is a potential of enhancing the efficiency and effectiveness of Malaysia's rail construction projects through the implementation of the Last Planner System (LPS) into Change Order Management (COM).

This study expects LPS to fix the existing gaps within COM practices and result in improved project management, time and costs' minimization, and enhanced satisfaction among stakeholders. The outcomes of this research will offer practical solutions to the policymakers and practitioners to enhance the rail project management in Malaysia and could be beneficial for other areas too.

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DECLARATION OF COMPETING INTEREST

None.

REFERENCES

Abdullah, Y. A., Khalid, N. S., Nawawi, F. N., Marzukhi, M. A., Ahmad Zaki, Z. & Leh, O. L. H. 2023. Rail-based transit-oriented development (TOD) from the public's perspectives in the Klang Valley, Malaysia. In *IOP Conference Series: Earth and Environmental Science* 1217: 012025. Institute of Physics. https://doi.org/10.1088/1755-1315/1217/1/012025

Alsehaimi, A. O., Fazenda, P. T. & Koskela, L. 2014. Improving construction management practice with the Last Planner System: A case study. *Engineering, Construction and Architectural Management* 21(1): 51–64. https://doi.org/10.1108/ECAM-03-2012-0032

Aslam, M., Baffoe-Twum, E. & Saleem, F. 2019. Design changes in construction projects – causes and impact on the cost. *Civil Engineering Journal (Iran)* 5(7): 1647–1655. https://doi.org/10.28991/cej-2019-03091360

Belayutham, S., Mohamad Jaafar, R. N. A., Ismail, H. B. & Che Ibrahim, C. K. I. 2022. Production planning, monitoring and review: Comparison between the practices in an urban rail transit megaproject with the Last Planner System. *TQM Journal* 34(3): 515–533. https://doi.org/10.1108/TQM-11-2020-0282

Daniel, E. I., Pasquire, C., Dickens, G. & Ballard, H. G. 2017. The relationship between the Last Planner® System and collaborative planning practice in UK construction. *Engineering, Construction and Architectural Management* 24(3): 407–425. https://doi.org/10.1108/ECAM-07-2015-0109

Dursun, B. 2023. A qualitative research technique: Interview. *Journal of Interdisciplinary Educational Research* 7(14): 100–113. https://doi.org/10.57135/jier

Erazo-Rondinel, A. A., Quispe-Alegria, D. A. & Salgado, J. 2021. Diagnosis and improvement of the level of implementation of the Last Planner® System in a construction project. In *2021 7th Congreso Internacional de Innovacion y Tendencias en Ingenieria, CONIITI 2021 - Conference Proceedings*. Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/CONIITI53815.2021.9619594

Fernandez, A., Trigo, B. & Aranguiz, S. 2020. Last planner system application in Recursos Norte project commissioning, El Teniente mine. In *Proceedings of the Ninth International Conference and Exhibition on Mass Mining*, pp. 973–987. Australian Centre for Geomechanics. https://doi.org/10.36487/acg_repo/2063_70

Ismaeil, E. M. H. & Sobaih, A. E. E. 2024. A proposed model for variation order management in construction projects. *Buildings* 14(3): 726. https://doi.org/10.3390/buildings14030726

Khoso, A. R., Khan, J. S., Faiz, R. U. & Akhund, M. A. 2019. Assessment of change orders attributes in preconstruction and construction phase. *Civil Engineering Journal (Iran)* 5(3): 616–623. https://doi.org/10.28991/cej-2019-03091273

Kortenko, S., Koskela, L., Tzortzopoulos, P. & Haghsheno, S. 2021. Can Last Planner® System help to overcome the negative effects of design-bid-build? In *IGLC 2021 - 29th Annual Conference of the International Group for Lean Construction - Lean Construction in Crisis Times: Responding to the Post-Pandemic AEC Industry Challenges*, pp. 787–796. Department of Engineering, Civil Engineering Division, Pontificia Universidad Catolica del Peru. https://doi.org/10.24928/2021/0184

Limenih, Z. M., Demisse, B. A. & Haile, A. T. 2022. The usefulness of adopting the Last Planner System in the construction process of Addis Ababa road projects. *Advances in Civil Engineering* 2022: 7846593. https://doi.org/10.1155/2022/7846593

Liu, F., Yang, G., Chen, Z., Zhang, Y. & Zhou, Q. 2023. Development of rail technology for high speed railway in China. *Railway Sciences* 2(4): 431–446. https://doi.org/10.1108/RS-08-2023-0026

Liu, L. L., Y. H. M. H. & S., Y. J. 2023. Research on construction data association management of urban rail transit based on BIM. *Electronic Journal of Structural Engineering* 23(1).

Naji, K. K., Gunduz, M. & Naser, A. F. 2022. Construction change order management project support system utilizing Delphi method. *Journal of Civil Engineering and Management* 28(7): 564–589. https://doi.org/10.3846/jcem.2022.17203

Nazrul, A., Ibrahim, H., Borhan, M. N., Asilah Zakaria, N. & Zainal, S. K. 2019. Effectiveness of commuter rail service toward passenger's satisfaction: A case study from Kuala Lumpur, Malaysia. *International Journal of Engineering & Technology* 8(1): 50–55. https://doi.org/10.14419/ijet.v8i1.2.24871

Pearse, N. 2019. An illustration of a deductive pattern matching procedure in qualitative leadership research. *Electronic Journal of Business Research Methods* 17(3): 143–154. https://doi.org/10.34190/JBRM.17.3.004

Sathiaseelan, P., Dava, A. D. B. & Mahmud, B. 2020. A study on determinants that effect Klang Valley (Malaysia) consumer preference in rail industry. In *IOP Conference Series: Materials Science and Engineering* 780: 072014. Institute of Physics Publishing. https://doi.org/10.1088/1757-899X/780/7/072014

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B. et al. 2018. Saturation in qualitative research: Exploring its conceptualization and operationalization. *Quality & Quantity* 52(4): 1893–1907. https://doi.org/10.1007/S11135-017-0574-8

Sbiti, M., Beddiar, K., Beladjine, D., Perrault, R. & Mazari, B. 2021. Toward BIM and LPS data integration for lean site project management: A state-of-the-art review and recommendations. *Buildings* 11(5): 196. https://doi.org/10.3390/buildings11050196

Senouci, A., Alsarraj, A., Gunduz, M. & Eldin, N. 2017. Analysis of change orders in Qatari construction projects. *International Journal of Construction Management* 17(4): 280–292. https://doi.org/10.1080/15623599.2016.1211973

Sharma, A. & Trivedi, J. 2021. Application of information theory in Last Planner® System for work plan reliability. In *IGLC 2021 - 29th Annual Conference of the International Group for Lean Construction - Lean Construction in Crisis Times: Responding to the Post-Pandemic AEC Industry Challenges*, pp. 727–736. Department of Engineering, Civil Engineering Division, Pontificia Universidad Catolica del Peru. https://doi.org/10.24928/2021/0147

Waty, M. & Sulistio, H. 2022. Impact of change orders on road construction project: Consultants' perspective. *Journal of Applied Engineering Science* 20(3): 736–744. https://doi.org/10.5937/jaes0-35894

Yap, J. B. H. & Skitmore, M. 2018. Investigating design changes in Malaysian building projects. *Architectural Engineering and Design Management* 14(3): 218–238. https://doi.org/10.1080/17452007.2017.1384714

Yusoff, I., Ng, B. K. & Azizan, S. A. 2021. Towards sustainable transport policy framework: A rail-based transit system in Klang Valley, Malaysia. *PLoS ONE* 16(3): e0248519. https://doi.org/10.1371/journal.pone.0248519

Zainuddin, N., Deraman, N., Cheok, L. Q. & Cui, X. H. 2022. Users' expectation on East Coast Rail Link (ECRL). *Quantum Journal of Social Sciences and Humanities* 3(6): 105–115. https://doi.org/10.55197/qjssh.v3i6.198