Poshdar, M., Herrera, R. F. & Gonzalez, V. A. (2023). Success in interrelated supply chain: an análisis of the human behaviour under crisis. *Proceedings of the 31st Annual Conference of the International Group for Lean Construction (IGLC31),* 1698–1708. doi.org/10.24928/2023/0201

SUCCESS IN INTERRELATED SUPPLY CHAIN: AN ANALYSIS OF THE HUMAN BEHAVIOUR UNDER CRISIS

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ABSTRACT

A wealth of studies is available on the key success factors of managing interrelated projects in a construction supply chain. The human factor, however, is often overlooked in normative success solutions. According to classical management theory, individuals are expected to act rationally and maximise their utility. Although, due to an individual's computational and cognitive abilities, decision-makers often choose the first satisfactory course of action rather than searching for the optimal course of action, particularly during times of crisis. This study adopted a surrogate model to conduct a series of laboratory simulations that involved human behaviour. A comprehensive literature review was conducted to determine the experiment design, followed by sixteen hours of experiments that spanned two countries investigating decision-making behaviour within two prominent management models: the traditional and collaborative models. In order to identify patterns in the perception of the participants regarding real success factors, a content analysis was performed on their questionnaire responses. This analysis identified three key characteristics of construction success and the top characteristics required to succeed under each model investigated. By sharing these insights and lessons learned, teams can gain a deeper understanding of what it takes to succeed in a competitive environment.

KEYWORDS

Supply chain management, Simulations, Collaborative, Action learning, Collaboration.

INTRODUCTION

In the wake of the COVID-19 pandemic, the "New Normal" is characterised by a crisis-like environment, deep uncertainty, and adaptability instead of stability and long-term planning (Araya, 2021). Consequently, preparedness, recovery, and adaptation decisions must be planned and deployed in the context of concurrent disruptions (Herrera et al., 2022). To date, the impacts of COVID-19 have received considerable attention across a wide range of industries. Nevertheless, the construction sector still has much to learn about the problem and potential solutions (Cherian & Arun, 2022). As with other industries, the construction, procurement, and logistics sectors experienced unforeseen disruptions due to COVID-19's rigorous lockdowns, which also affected supply chain management. It exacerbated the chronic issues of cost overruns, schedule delays, and low productivity in the construction industry (Doloi, 2013;

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Herrera et al., 2020; Venkatesh & Venkatesan, 2017). Research indicates that improving the product development process, supply chain coordination, and the standardisation of parts and components can mitigate the impact of these recurring issues. In order to achieve these goals, the importance of improving client-contractor interactions cannot be overstated, particularly through establishing strategic alliances and partnerships that facilitate real collaboration (Chen et al., 2012; Dainty et al., 2001; Engebø et al., 2020; Lahdenpera, 2017; Mesa et al., 2019).

Lean emphasises collaboration, supported by process ontology, to address the interrelationships between tasks (Tzortzopoulos et al., 2020). The success of any collaborative approach depends on the participation of individuals. While normative solutions are often used to achieve operational goals, they tend to rely on simplistic behavioural assumptions that fail to take into account the complexity of human behaviour (Ghodrati et al., 2022; Gino & Pisano, 2008; González et al., 2015). The classical economics theory typically assumes that individuals act rationally and make decisions to maximise their utility (Parnell & Crandall, 2020). However, rationality is bounded by human computational and cognitive capabilities (Selten, 1990). Consequently, decision-making patterns in projects are often inconsistent with normative theories, especially in complex situations (Kahneman et al., 1982). In 1957, the concept of bounded rationality was introduced (Simon, 1957). The approach emphasises effective behaviour rather than an idealised state of perfect rationality. Informational inadequacies, time constraints, and cognitive limitations all contribute to the inability to make perfect, rational, and well-informed decisions. (Diacon et al., 2013). It is, therefore, more likely that in times of crisis, a satisfactory or suitable decision will be reached in which the decisions are adequate but not perfect. (Parnell & Crandall, 2020). When faced with such circumstances, decision-makers often choose the most suitable course of action instead of continuing to search for the optimal course of action (Fox, 2015).

Our primary objective in this study was to explore how behavioural patterns in decision-making can be linked to the construction supply chain dynamics, especially during a crisis. This research belongs to the behavioural operations management field and adopts a laboratory-based experimental strategy applied in a number of social science fields, including economics, psychology and sociology, law, political science, anthropology and biology (Katok, 2019). There is a high cost and/or disruption associated with investigating the influence of human behaviour on collaboration dynamics in a real system under a variety of conditions. A laboratory experiment can simulate a situation while isolating the intended variables from the rest. Laboratory experiments became mainstream research setting in social science in 1875. It was not until the 1980s that operations management research began to take it up. As a result, surrogate models are the preferred approach for laboratory simulations. They allow a complete manipulation of all factors to match the study assumptions (Bolton & Ockenfels, 2008).

RESEARCH DESIGN

The overall research design is presented in Figure 1. The study started with an extensive literature review to identify the experiment design. The experiments were conducted in two countries over four days, consisting of two rounds each day. In the first round, all participants acted independently, simulating the traditional supply chain management model. Participants adopted a collaborative approach in the second round, in which they agreed to work together to achieve a specific objective. The decision behaviour patterns of participants were recorded and analysed based on their perceptions. To obtain participants' perceptions regarding their experiences under each model, a questionnaire was administered after each round. Upon completion of day 4, a content analysis was carried out to identify patterns in the recorded results. By conducting the same experiment in two different countries, we were able to detect any cultural nuances that might have impacted the results.

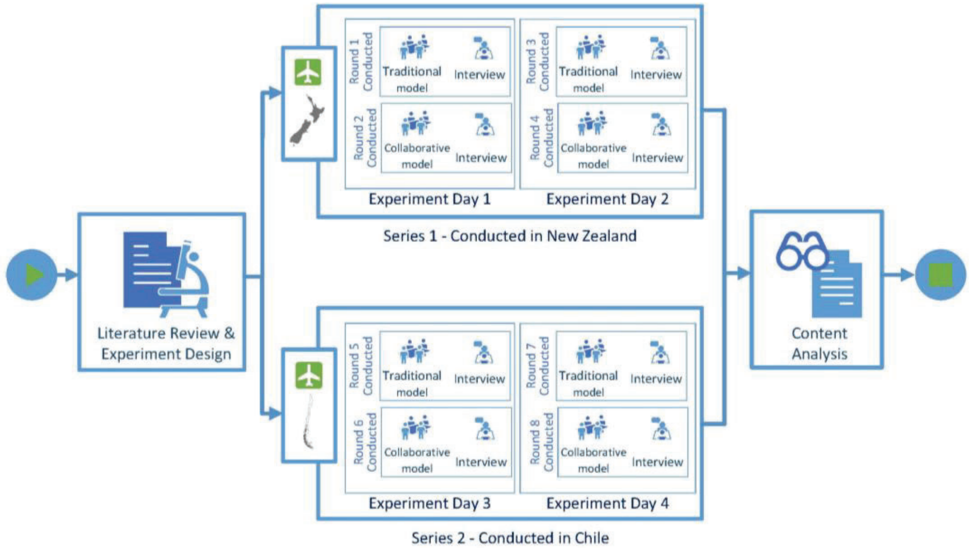


Figure 1: The research design

THE EXPERIMENT STRUCTURE

The experiment simulated a simplified version of the supply chain for five bridge construction projects, including prefabrication and shipping stages. Figure 2 shows the entities and relationships involved in creating a conceptual model of a system according to the standard steps (Abdelmegid et al., 2017; Abdelmegid et al., 2020; Poshdar et al., 2016). A total of six individuals representing key members of the supply chain participated in the experiment.

- Two participants represented the manufacturers responsible for fabricating the structural components (Fabricator 1 and Fabricator 2).
- Two participants represented transportation agencies responsible for delivering prefabricated components to the construction site (Shipping 1 and Shipping 2).
- Two participants represented contractors involved in the construction project (Contractor 1 and Contractor 2).

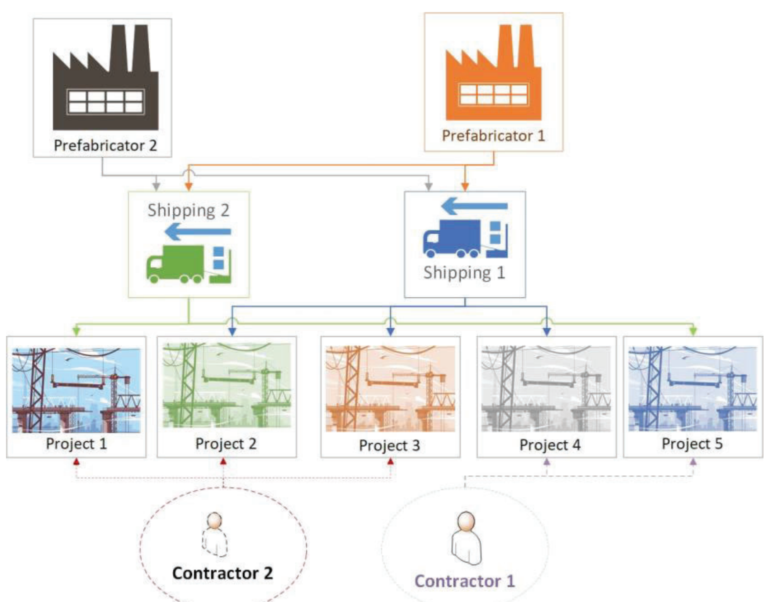


Figure 2: The experiment structure

The bridge components were those recommended by Waka Kotahi, the New Zealand Transport Authority. Detailed information about the simulated projects is presented in Table 1.

Table 1: Characteristics of the projects simulated.

Project #	Number of beams	Type of beams	Span length (mm)	Shipping distance (km)
Project 1	9	Single hollow core beam, 900 mm Depth	25,000	450
Project 2	5	Super T beams	30,000	86
Project 3	4	Single hollow core beam	27,500	242
Project 4	9	Single hollow core beam, 650 mm Depth	18,000	91
Project 5	9	Single hollow core beam, 650 mm Depth	16,000	408

A rough budget was assigned to each activity based on the size of the project and shipping distance (Table 2).

Table 2: Budgets allocated to each activity within the supply chain divided by projects.

Project #	Prefabrication ($)	Transportation ($)	Construction ($)
Project1	277,000	208,000	2,079,000
Project2	277,000	46,000	2,703,000
Project3	185,000	46,000	2,657,000
Project4	277,000	46,000	1,409,000
Project5	277,000	116,000	1,409,000

A 10% contingency was built into the quantity take-off price in the budget. The calculated prices are summarised in Table 3.

Table 3: Summary of activity costs.

Costs Associated	Prefabrication ($ Per week)		Transportation ($ Per week)	Construction ($ Per week)						
	Line set up.	Operations	Operations	Site Establishment	Staging Installation	Precast Beam	Deck	Parapet	Remove Staging	Urban Design & Walkways
Direct cost	8,000	68,000	9,000	120,000	40,000	40,000	70,000	20,000	70,000	30,000
Overhead	2,000	2,000	1,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Total	10,000	70,000	10,000	130,000	50,000	50,000	80,000	30,000	80,000	40,000

Each participant could face two types of delays to imitate real-life pressure on a decision-maker.

- Normal delay that its likelihood was between 6% to 10%, which was implemented as a randomly generated number for each activity.
- A pandemic delay would apply a locked-down period with an arbitrary length of between 5 and 10 weeks. The purpose of this study was to examine the decision-making behaviour of supply chain members during times of crisis. Therefore, all experiments involved the delay caused by a pandemic.

THE EXPERIMENT PROTOCOL

Each round of the experiment involved the following five steps:

Step 1 - The facilitator described the experiment structure and rules, allocated roles and funds. The roles were assigned randomly, and participants remained with the same role for the whole experiment. A random number generator was then used to determine the length and the start week of the delay caused by the pandemic. The participants were not informed about this latter information until the due week.

Step 2 – Participants started planning their operations. They could decide when to start each activity to minimise costs and maximise profit. However, once it had begun, they could not stop overhead payments or add additional working shifts to speed things up. The reactive approaches were restricted in order to avoid an overwhelming level of complexity.

Step 3 – The experiment set the time unit of the operations as weeks. The facilitator would announce the start of each week while running a random number generator to identify and inform the participants about the typical delay for each activity. The players would implement their plan accordingly, and the costs were deducted per operating over a week.

Step 4 – A full round of the experiment finished when all participants had their activities completed.

Step 5 – A questionnaire with the following five open-ended questions distributed among the participants. It was used to assess participants' perceptions of the factors that influenced their decision patterns, and those that could contribute to their success under each model.

Did you find any operational strategy useful to achieve success in the collaborative phase?

What would you do if, at some point, your profit opposed the team's benefit under the collaborative model? Have you ever encountered such a situation in this experiment?

What are the top five characteristics that can help a player succeed in a collaborative environment? Why?

What are the top five characteristics that can help a player succeed in the traditional model? Why?

Although we provided some examples for questions 3 and 4, participants were given the autonomy to include any items they deemed relevant.

The criteria for success in these experiments were defined based on two common Key Performance Indicators (KPIs): time and cost. The measurement of success was based on the achievement of these criteria. In order to create personal incentives, in each round, the participant who could achieve the highest ratio of earnings to the allocated budget would receive a 30$ voucher and a bar of Chocolate.

IMPLEMENTATION OF THE EXPERIMENTS

During April and May 2022, four rounds of experiments were carried out in New Zealand, two simulating the traditional model and two simulating the collaborative model. Twelve undergraduate engineering participants participated in this series. In August and September 2022, the same four rounds of simulations were conducted with 18 undergraduate civil engineering participants from Chile. A random sampling approach was used to select the participants. Since each individual in the population had an equal chance of participating, regardless of their characteristics or traits, this approach ensured a reduced bias in the results.

The experiment took an average of two hours for each round. Thus, a full experiment day took around four hours, and a total of sixteen hours were spent conducting the experiments for this study. All decisions and movements made by the participants were recorded using a spreadsheet. The following is a breakdown of the average completion length (in nominal weeks) recorded for each project: Project 1: 45; Project 2: 41; Project 3: 36; Project 4: 25; Project 5: 31.

RESULTS AND DISCUSSION

The first question invited participants to reflect on their experiences and identify strategies that proved effective in achieving success.

The result: Communication and coordination were among the most frequently recorded success factors. *The Discussion:* Transparent communication from the beginning of projects was indicated to be crucial to planning and minimising downtimes. A well-coordinated strategy is essential for the success of any team effort. In a competitive environment, this is even more critical. Additionally, the participants stressed the importance of teamwork and collaboration when prioritising activities. Working together to identify long-term goals helps ensure that all team members work towards a common goal and can prioritise their activities accordingly (Zulch, 2014). In order to achieve success, the participants also suggested that an initial kick-off meeting could be an instrumental step, as it can enable discussion of strategies and the development of agreements with others. These meetings allow all shareholders to discuss strategies and reach agreements about the common goal.

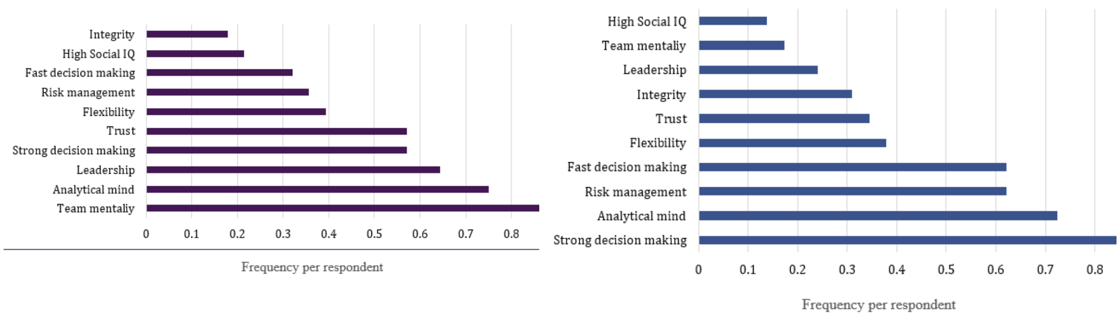
Managing projects effectively requires a global and systemic understanding of operations and supply chain members. With a global perspective, managers can identify areas where costs and delays can be reduced. Additionally, by having a systemic view of the supply chain, they can assess potential risks and plan accordingly to ensure that the project is completed on time and efficiently. To involve a systemic understanding in project management, managers should create a detailed map of the entire supply chain, identify bottlenecks, and analyse the dependencies between each supply chain member. It will help them to identify opportunities for cost savings, as well as potential areas of risk. Additionally, they should create a timeline for the entire project and ensure that all stakeholders and supply chain members know their responsibilities and deadlines (Chou & Yang, 2012).

The result: In addition, the participants stressed the importance of mutual agreement and trust between all parties to achieve success. *The Discussion:* In order to ensure that the project is completed effectively, it is imperative to build trust and establish positive relationships between all parties. It ultimately reduces disputes, reduces costs, and increases overall project success. These relationships should be maintained throughout the project timeline to ensure everyone is on the same page and working towards a successful outcome. Trust can be built through regular meetings between parties to review progress and discuss any potential issues or risks. Additionally, creating a safe and open environment where people can share their ideas, concerns, and feedback is another way to establish trust and build strong relationships (de Oliveira & Rabechini Jr, 2019; Karlsen et al., 2008).

The second question presented a thought-provoking dilemma for the participants, testing the balance between personal gain and team success. Having personal interests that conflict with team benefits is a real-life scenario that can occur in a variety of contexts, including construction.

The result: The answers show that the participants understand the importance of teamwork for achieving success under a collaborative model. Participants prioritised common benefits and collaboration in decision-making, while also emphasising the importance of optimising the global project and synchronising agents. Despite the potential for individual gains, sacrificing personal gain for the greater good of the team was seen as critical by the participants, who displayed a high level of integrity in choosing the team's benefit over their own profit. *The Discussion:* The participants' emphasis on prioritising common benefits, collaborating in decision-making, and sacrificing personal gain for the team's benefit are in line with the literature on effective team dynamics and collaboration. The collaborative model, in which parties share profits, risks, and responsibilities, is becoming increasingly popular in the construction industry as a means of fostering collaboration and improving project outcomes (Anvuur & Kumaraswamy, 2007; Elghaish et al., 2020; Giménez et al., 2022; Lahdenperä, 2012).

It is paramount to possess certain key characteristics to succeed in the collaborative model in the construction and project management world. It led to the third question covering the top qualities of success in the collaborative model.



(a) The collaborative approach (b) The traditional approach

Figure 3: The perspectives about the success factors

Figure 3 (a) summarises the ideas based on the frequency of occurrence in the responses to question 3.

The result: According to the participants, team mentality and approaching the project as a collective effort were the most relevant characteristics for success in a collaborative environment. *The discussion:* When the team is united, they can share ideas and resources more effectively and better understand each other's strengths and weaknesses. It allows them to better coordinate tasks and collaborate on solutions (Mack et al., 2008).

The result: A strong analytical mind was found to be among the top three important factors to success for participants. It allows them to assess situations, identify potential problems, and make informed decisions. *The discussion:* teams need to understand better the problem and the resources available to find solutions more effectively. Analytical skills can assist teams in resolving problems more effectively, creating a more harmonious environment that facilitates achieving the desired results (Asfar et al., 2021).

The result: Participants ranked leadership as the third most influential factor that would lead to success. *The discussion:* It involves leading the team to achieve common goals, making decisions, and resolving conflicts. Effective leaders can motivate the team, inspire them to work together, and set a positive example. They can listen to the team and consider their opinions when making decisions. They can also manage conflicts effectively and maintain a healthy work atmosphere (Nishizaki & Seed, 2015). There was some difference between the identified success factors of the traditional model and those of the collaborative model. **Error! Reference source not found.**(b) summarises the answers to the fourth question regarding the success factors of the traditional model based on the frequency of items among the responses.

The result: In the eyes of our participants, strong decision-making stood first among all other success factors. *The discussion:* The construction sector often involves a considerable amount of decision-making, risk assessment and quick thinking. It is particularly critical to developing these skills in traditional models. In the model, individuals are valued for managing risks effectively and coming up with smart decisions (Flyvbjerg, 2021). Therefore, it is crucial to have strong decision-making skills, as decisions are expected to be reached quickly and effectively without the support of a large team.

The result: Strong decision-making skills are crucial in the traditional model, as participants are expected to make quick and effective decisions without relying on the support of a larger team. *The discussion:* A strong analytical mind was also listed as one of the three most important characteristics of success in this model. An analytical mind helps individuals better understand the world's complexities, identify patterns, and make informed decisions that can lead to greater success (Alvarenga et al., 2019).

The result: Risk management has been identified as one of the top three success factors in the traditional model. *The discussion:* A thorough understanding of the construction industry and a strong ability to assess risks and evaluate potential outcomes are required for supply chain members to assess risks, evaluate potential outcomes, and make decisions accordingly. Risk management can assist in identifying and resolving upcoming problems before they become issues. Moreover, it can minimise the negative effects of any risks that may occur and ensure that the project remains on schedule and within budget (Micán et al., 2020).

The result: Both the collaborative and traditional models in the construction industry emphasise analytical mind but require different specific traits for success. The collaborative model emphasises team mentality and leadership, while the traditional model emphasises strong decision-making and risk management.

The result: Most participants preferred the collaborative model over the traditional one to achieve success when asked after the experiments. The main reason for this preference was the ability to better coordinate and communicate with their peers, which led them to make more effective and efficient decisions which could result in lower risk-taking. Participants believed collaboration and teamwork could improve workflow, reduce costs, and achieve better results. The collaborative model, according to them, also contributed to more equitable profit distribution and improved performance. Additionally, participants noted the importance of sharing information and risks, as well as enhanced synchronisation, which contributed to their success. Overall, participants reported that the collaborative model provided better coordination, communication, and cooperation among all members, resulting in faster, more efficient, and more successful outcomes.

The result: Although there were some differences in frequency between the two countries, the items and their order followed a similar pattern. It suggests that the findings were largely independent of the work environment in the two countries, providing an accurate comparison for further research.

CONCLUSIONS

Using a laboratory experiment methodology, behavioural operations management research was conducted to examine how decision-making behaviour patterns and crises impact typical construction supply chain members. We conducted four days of experiments in two countries, each with two rounds. A traditional work model was simulated in the first round, while a collaborative approach was tested in the second round. After the administration of a questionnaire and a content analysis, several key points were identified.

When comparing the collaborative and traditional models of managing supply chains in the construction industry, it is evident that both models prioritise certain key characteristics, such as analytical thinking. However, it is imperative to note that each model requires different characteristics to succeed. The collaborative model emphasises team mentality and leadership. In this model, it is essential to have a team player who collaborates with others. Any team member should be able to prioritise the team's benefit over their interests. Additionally, effective team leadership and management practices can facilitate team cohesion and support collaborative project management efforts.

On the other hand, the traditional model emphasises traits such as decision-making ability and risk management ability. In this approach, various stakeholders are expected to work independently. It is essential for individuals to possess strong decision-making skills and manage risks independently. Effective decision-making involves evaluating multiple options and choosing the most appropriate course of action based on relevant information, while risk management involves identifying and mitigating potential hazards and uncertainties.

Sharing insights and lessons learned from these experiments contributed to developing a collective understanding of what it takes to succeed in a competitive environment. Teams seeking to improve their performance and achieve their objectives can benefit from this information.

This study presents the first step in developing a laboratory experimental approach to investigating management strategies. There were some limitations to this study regarding the number of experiments, the number of models tested, and the sampling criteria for participants. Therefore, further research is required to verify the reliability of the results. During future research, experiment sizes will be increased, and new models will be tested using different sampling criteria for participants. Cognitive errors may also have negatively affected the results. For example, trust, team mentality and integrity are three concepts susceptible to being confused in participants' minds. In order to accurately measure data, it is critical to define reliable indicators for each concept. To determine the impact of these factors separately, it would be appropriate to focus on one concept at a time. It would ensure that the data collected is specific to that concept and not impacted by any other concepts being studied. It will help to minimise ambiguity and ensure that the data accurately reflects the intended meaning of the concepts.

ACKNOWLEDGMENTS

We would like to thank Dr Nariman Ghodrati, all participants and the teaching assistants who took part in the simulations. We would also like to thank the Collaborative International Interuniversity Research, Innovation and Development Program of the Auckland University of Technology and Pontificia Universidad Católica de Valparaíso for funding this research project through the CIIRID IDEA Funds.

REFERENCES

Abdelmegid, M. A., González, V. A., Naraghi, A. M., Sullivan, M. O., Walker, C. G., & Poshdar, M. (2017, 3-6 Dec. 2017). Towards a conceptual modeling framework for construction simulation. 2017 Winter Simulation Conference (WSC),

Abdelmegid, M. A., González, V. A., O'Sullivan, M., Walker, C. G., Poshdar, M., & Ying, F. (2020, 2020/10/01/). The roles of conceptual modelling in improving construction simulation studies: A comprehensive review. *Advanced Engineering Informatics, 46*, 101175. https://doi.org/https://doi.org/10.1016/j.aei.2020.101175

Alvarenga, J. C., Branco, R. R., Guedes, A. L. A., Soares, C. A. P., & e Silva, W. d. S. (2019). The project manager core competencies to project success. *International Journal of Managing Projects in Business*.

Anvuur, A. M., & Kumaraswamy, M. M. (2007). Conceptual model of partnering and alliancing. *Journal of Construction Engineering and Management, 133*(3), 225-234.

Araya, F. (2021). Modeling working shifts in construction projects using an agent-based approach to minimize the spread of COVID-19. *Journal of Building Engineering, 41*, 102413. https://doi.org/https://doi.org/10.1016/j.jobe.2021.102413

Asfar, A., Ahmad, M. A., & Asdar, A. (2021). Elaboration of Active Knowledge Sharing Learning Model to Improve High Order Thinking Skills Integrated 4C. *Asian Journal of Applied Sciences, 9*(4).

Bolton, G. E., & Ockenfels, A. (2008). *Chapter 59 Self-centered Fairness in Games with More Than Two Players* (Vol. 1) [Review]. https://doi.org/10.1016/S1574-0722(07)00059-5

Chen, G., Zhang, G., Xie, Y.-M., & Jin, X.-H. (2012). Overview of alliancing research and practice in the construction industry. *Architectural Engineering and Design Management, 8*(2), 103-119. https://doi.org/https://doi.org/10.1080/17452007.2012.659505

Cherian, T. M., & Arun, C. J. (2022). COVID-19 impact in supply chain performance: a study on the construction industry. *International Journal of Productivity and Performance Management*(ahead-of-print). https://doi.org/https://doi.org/10.1108/IJPPM-04-2021-0220

Chou, J.-S., & Yang, J.-G. (2012). Project management knowledge and effects on construction project outcomes: An empirical study. *Project Management Journal, 43*(5), 47-67.

Dainty, A. R., Briscoe, G. H., & Millett, S. J. (2001). Subcontractor perspectives on supply chain alliances. *Construction Management and Economics, 19*(8), 841-848. https://doi.org/https://doi.org/10.1080/01446190110089727

de Oliveira, G. F., & Rabechini Jr, R. (2019). Stakeholder management influence on trust in a project: A quantitative study. *International Journal of Project Management, 37*(1), 131-144.

Diacon, P.-E., Donici, G.-A., & Maha, L.-G. (2013). Perspectives of economics–behavioural economics. *Theoretical and Applied Economics, 20*(7), 27-32.

Doloi, H. (2013). Cost overruns and failure in project management: Understanding the roles of key stakeholders in construction projects. *Journal of Construction Engineering and Management, 139*(3), 267-279. https://doi.org/https://doi.org/10.1061/(ASCE)CO.1943-7862

Elghaish, F., Abrishami, S., & Hosseini, M. R. (2020). Integrated project delivery with blockchain: An automated financial system. *Automation in Construction, 114*, 103182.

Engebø, A., Lædre, O., Young, B., Larssen, P. F., Lohne, J., & Klakegg, O. J. (2020). Collaborative project delivery methods: A scoping review. *Journal of civil engineering and management, 26*(3), 278-303. https://doi.org/https://doi.org/10.3846/jcem.2020.12186

Flyvbjerg, B. (2021). Top ten behavioral biases in project management: An overview. *Project Management Journal, 52*(6), 531-546.

Fox, J. (2015). From “economic man” to behavioral economics. *harvard business review, 93*(5), 78-85.

Ghodrati, N., Yiu, T. W., Wilkinson, S., Poshdar, M., Talebi, S., Elghaish, F., & Sepasgozar, S. M. (2022). Unintended consequences of productivity improvement strategies on safety behaviour of construction labourers; a step toward the integration of safety and productivity. *Buildings, 12*(3), 317.

Giménez, Z., Mourgues, C., Alarcón, L. F., & Mesa, H. (2022). Exploring value generation in target value design applying a value analysis model. *Buildings, 12*(7), 922.

Gino, F., & Pisano, G. (2008). Toward a theory of behavioral operations [Article]. *Manufacturing and Service Operations Management, 10*(4), 676-691. https://doi.org/10.1287/msom.1070.0205

González, V. A., Sacks, R., Pavez, I., Poshdar, M., Priven, V., & Ben Alon, L. (2015, 28-31 July, 2015). Interplay of Lean Thinking and Social Dynamics in Construction. 23rd Annual Conference of the International Group for Lean Construction, Perth, Australia.

Herrera, R. F., Lagos, C. I., Luna, R. M., & Alarcón, L. F. (2022). Method to Allocate Covid-19 Preventive Means of Construction Works Based on Expert Prioritization. 738–749.

https://doi.org/https://doi.org/10.24928/2022/0185
Herrera, R. F., Sánchez, O., Castañeda, K., & Porras, H. (2020). Cost overrun causative factors in road infrastructure projects: A frequency and importance analysis. *Applied Sciences, 10*(16), 5506. https://doi.org/https://doi.org/10.3390/app10165506
Kahneman, D., Slovic, S. P., Slovic, P., & Tversky, A. (1982). *Judgment under uncertainty: Heuristics and biases*. Cambridge university press.
Karlsen, J. T., Græe, K., & Massaoud, M. J. (2008). Building trust in project-stakeholder relationships. *Baltic journal of management, 3*(1), 7-22.
Katok, E. (2019). Designing and conducting laboratory experiments. In *The Handbook of Behavioral Operations* (pp. 1-33). wiley. https://doi.org/10.1002/9781119138341.ch1
Lahdenpera, P. (2017). Towards a coherent theory of project alliancing: Discovering the system's complex mechanisms yielding value for money. *Construction Economics and Building, 17*(2), 41-61. https://doi.org/https://doi.org/10.5130/AJCEB.v17i2.5292
Lahdenperä, P. (2012). Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery. *Construction Management and Economics, 30*(1), 57-79.
Mack, N., Bunce, A., & Akumatey, B. (2008). A logistical framework for enhancing team dynamics. *Handbook for team-based qualitative research*.
Mesa, H. A., Molenaar, K. R., & Alarcón, L. F. (2019). Comparative analysis between integrated project delivery and lean project delivery. *International Journal of Project Management, 37*(3), 395-409.
Micán, C., Fernandes, G., & Araújo, M. (2020). Project portfolio risk management: a structured literature review with future directions for research. *International Journal of information systems and project management, 8*(3), 67-84.
Nishizaki, S. S., & Seed, W. R. (2015). Project Manager or Project Leader: What it Takes to Create a High Performing. Seppänen, O., González, VA & Arroyo, P., 23rd Annual Conference of the International Group for Lean Construction. Perth, Australia,
Parnell, J. A., & Crandall, W. R. (2020). The contribution of behavioral economics to crisis management decision-making. *Journal of Management & Organization, 26*(4), 585-600. https://doi.org/10.1017/jmo.2017.60
Poshdar, M., González, V., O'Sullivan, M., Shahbazpour, M., Walker, C., & Golzarpoor, H. (2016). The Role of Conceptual Modeling in Lean Construction Simulation. 24th Annual Conference of the International Group for Lean Construction, Boston, USA,
Selten, R. (1990). Bounded rationality. *Journal of Institutional and Theoretical Economics (JITE)/Zeitschrift für die gesamte Staatswissenschaft, 146*(4), 649-658.
Simon, H. A. (1957). Models of man; social and rational.
Tzortzopoulos, P., Kagioglou, M., & Koskela, L. (2020). *Lean Construction : Core Concepts and New Frontiers*. CRC Press LLC. http://ebookcentral.proquest.com/lib/aut/detail.action?docID=6124221
Venkatesh, P. K., & Venkatesan, V. (2017). Delays in construction projects: a review of causes, need and scope for further research. *Malaysian Construction Research Journal, 23*(3), 89-113.
Zulch, B. (2014). Communication: The foundation of project management. *Procedia Technology, 16*, 1000-1009.