EPiC Series in Built Environment
Volume 7, 2026, Pages 495–504
Proceedings of Associated Schools of Construction 62nd Annual International Conference

Project Management Approaches Influencing Sustainable Practices Adoption in UK Construction Organizations in Lack of Knowledge, Reluctant Behaviours and Economic Issues

Rashid Maqbool[1], Jialin Li[1], Eaint Mhu Khin[2], and Saleha Ashfaq[1]
[1]The University of Manchester, [2]Northumbria University

With all the efforts in placed to implement sustainability actions in construction industry, still huge hindrances are in the way in the form of Lack of Knowledge, Reluctant Behaviours and Economic Issues. Considering these important issues, this research is initiated to investigate the role of project management approaches towards sustainable practices adoption in the construction organisations, while tackling matters related to sustainability hindrances. The quantitative survey data was collected from the 205 construction professionals in the UK. Whereas the qualitative data was collected from the seven industry experts. To understand the statistical inferences of the data Bivariate Correlation and Hierarchical Multiple Regression (HMR) analysis are used for the survey data. Whereas the panel data was analysed through Interpretive Structural Modeling (ISM). The findings revealed that the project management approaches are significantly affecting the sustainable construction practices adoptions. It is reported that the moderating effects of knowledge gaps, economic issues and personal resistance are not significant consequences to the UK construction organizations when the project management approaches are involved. These findings were validated by Interpretive Structural Modeling (ISM). Thus, effective usage of the project management system can lead to a better understanding of the sustainability adoption in the construction industry.

Keywords: Sustainable Construction, Project Management Practices, Economic Issues, Lack of Knowledge, Reluctant Behaviour.

Introduction

It is a critical challenge to integrate sustainability into construction projects. The construction industry needs to move towards sustainable practices since the activities contribute adverse effect on the environment as well as significant social and economic impact. It has potential to contribute significantly towards sustainable development which balances the economic expenses, social benefits and environmental impacts. Effective sustainable construction methods and guidelines must be implemented to minimize the negative consequences of construction operations on the environment and community. Sustainable construction involves designing a built environment by using resource-efficient, ecologically based standards and procedures (Hussin, Rahmon and Memon, 2019).

Despite this surge of interest and the popularity of sustainability, such practices are still left behind in UK construction industry compared to those of other sectors. In practice, promoting sustainable development in the UK construction sector is quite challenging. Sustainable development has some challenges since the general population may not fully understand the concept (Onwueme and Borsari, 2007). Therefore, only a small group of people are likely to accept it rather than the whole population. Consequently, the implementation of sustainability in the construction projects creates potential disagreement which leads to reluctance of the individuals as well as causes economic problems (Darko et al., 2017). In order to support the construction industry's sustainable development, this study addresses the impact of the contribution of project management techniques to the adoption of sustainable practices in UK construction organisations and also hurdles to adoption.

Sustainable project management is considered as introducing social, economic, and environmental sustainability principles (TBL) into efficient project delivery, with the goals of environmental protection, social well-being and economic growth (Maqbool et al., 2025). The primary attention on the sustainability of the construction has been a “biased perspective” towards environmental aspect over the last decades (Cruz, Gaspar and de Brito, 2019). It is essential to consider three dimensions (environmental, social, economic) in order to avoid a micro perception of sustainability. In general, the environmental pillar receives more interest; nevertheless, it is equally essential to consider the social and economic aspects of sustainability. The environmental sustainability aspect in construction refers to the preservation and protection of the built and natural environments by minimizing energy consumption and emissions as well as making efficient use of natural resources (Misopoulos et al., 2019). In other words, it is important to restrict adoption of natural resources without endangering future generations.

Challenges in Pursing Sustainable Construction

Despite the apparent merit of sustainable construction, the implementation process can be challenging. Multiple studies have indicated that there are a variety of barriers that construction organizations must overcome in order to adopt the sustainability approach, including leadership and responsibility, culture issues, inadequate government support, absence of specific regulation, lack of stakeholders’ engagement, external pressure from the client and colleagues (Sarhan and Fox, 2013). In addition to those barriers, the economic barriers, lack of knowledge and reluctant attitude and behaviour can be considered as the critical hindrances to the accomplishment of sustainable construction practices (Darko et al., 2017).

Economic Issues

Sustainable infrastructures and buildings can be achievable with adoption of green technology. Despite the benefits of digital technology, adoption of technology comes with a number of challenges. According to Zhou and Lowe (2003), the promotion of sustainable building confronts various economic hurdles due to a lack of awareness of the potential benefits that can be accomplished. Aghimien, Aigbavboa and Thwala (2019) revealed that the primary barrier is many respondents assumed the sustainable activities would increase expenses since they will require greater investments in technology, equipment, and training to meet sustainability criteria. This is further mentioned by Zhang, Shen and Wu, (2011) that construction of sustainable infrastructure tends to cost more than traditional construction projects due to design complication and modelling expenses. Hydes and Creech (2000) also informed that apart from higher costs, there are possible dangers caused by unusual procedures, a lack of previous knowledge and skills, additional testing and inspection during construction activities and a lack of support from manufacturers and contractors.

Lack of Knowledge

Adoption of sustainable building approaches requires general public awareness, as well as adequate knowledge and understanding of sustainability (Opoku and Ahmed, 2015). Furthermore, Häkkinen and Belloni (2011) highlighted that the lack of knowledge or general awareness of sustainability might be a hurdle to sustainable constructions. In addition to having strong knowledge, professionals working in the built environment must be able to apply that information to the design and execution of projects which will generate sustainable development (Willar et al., 2021). Even though project teams having access to data and knowledge on the technologies and resources available to accomplish sustainable buildings, stakeholders must be informed of sustainable measures (Djokoto, Dadzie and Ohemeng-Ababio, 2014). The public's awareness of sustainability is also a crucial component to adopting sustainable practices. Sustainable buildings and infrastructure eventually improve based on the demand and cooperation of clients (Häkkinen and Belloni, 2011). The performance outcome may be influenced by a lack of technical skill, inadequate understanding, or unfamiliarity with the sustainable construction's technologies, materials, processes, or design (Hawang and Tan, 2012).

Reluctant Attitude/Behaviour

Moving from the known to the unfamiliar may often be challenging, and as a result, resistance to change may be observed. This is because individuals with limited understanding ignore any option that is not widely adopted. It is common that most people would probably keep to what they are acquainted with rather than risk learning something new (Newman et al., 2021). According to Erwin and Garman (2010), an individual’s resistance to change can be characterized into three dimensions: cognitive, affective and behavioural. The first two elements are believed to be the reasons why resistance arises, while the behavioural dimension shows how resistance expresses itself in observable behaviours and acts (Fiedler, 2010). Many assumed that reluctant behaviour or attitude is an individual response to change but it can be also shown by departments or professional groups or external stakeholders (Chreim, 2007). Besides, Smollan (2011) mentioned that resistance to change may be triggered by poor management. Generally, resistance has been recognized as a negative aspect because it hinders organizations from accomplishing their goals.

Methodology

A selection of techniques for both obtaining data and procedures for analyzing them are considered according to the ‘Research Onion’, provided by Saunders, Lewis and Thornhill, (2007). Mixed method approach; consisting questionnaire survey and a panel interview was utilsed.

Quantitative Research Approach: Questionnaire Survey

Based upon the extent review of relevant literature, a survey questionnaire was prepared to collect the quantitative data. The survey consists of “closed-ended” questions which required the respondents to provide a short response. The first part was designed to collect respondents' demographic information, such as job status, education background, and industry experience. In the second part, the research specific questions are developed based on Likert scale. The second section requires respondents to rate how much they agree or disagree with the statement.

Qualitative Research Approach: Interpretive Structural Modeling

For the second research method, the researcher applied assessment through Interpretive Structural Modeling (ISM) technique by applying professionals' expertise of various elements related to the issue, ISM identifies interrelationships between components of interest in a particular subject (Kumar and Goel, 2022). In other words, this method is an interpretation of a group of decision makers' judgement on the relationships between the variables. The researcher performed ISM as the second approach to discover the complicated structural link between multiple factors. Interpretive Structural Modeling (ISM) procedure is implemented using graphical software called SmartISM Software, which displays graphic models of variables along with the relationships among them. The researcher invited seven experts who have worked or are currently working in UK construction industry as representative decision makers for this research. An interview was conducted face-to-face using a matrix-type questionnaire administered to experts. The relationship between the variables is indicated by one of the following four symbols: (a) V stands for role variable influencing column variable (b) A stands for role variable being influenced by column variable (c) X stands for both variable relations (d) O stands for no relation between two variables. The participants assigned the contextual relationship between any two variables and the most frequent symbol applied for each paired relation was inputted into the Excel File before entering the software.

Results

Quantitative Research Findings: Questionnaire Survey

The response rate of survey was 82%, most of the respondents had bachelor's degree (47.8%) as their highest educational qualifications and more than one-third of the respondents (38%) were professional engineers in the construction industry. The majority of the professionals (36.6%) have 6-10 years' experience in the industry while 6.8% of them have more than 21 years industry experience. The data were evaluated by hierarchical multiple regression analysis (see Table 1). This method is utilised to test the extent to which economic issues (EI), lack of knowledge (LK) and reluctant attitude/behavior (RAB) affect project management practices (PMP) and sustainable construction approaches (SP).

Table 1. Regression Analysis Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	1.628	.160		10.159	<.001
	PMP	.566	.035	.749	16.091	<.001
2	(Constant)	1.169	.180		6.499	<.001
	PMP	.408	.046	.540	8.943	<.001
	EI	.165	.048	.214	3.424	<.001
	LK	.070	.052	.081	1.344	.180
	RAB	.048	.035	.070	1.377	.170
3	(Constant)	-.342	.869		-.394	.694
	PMP	.755	.195	1.000	3.875	<.001
	EI	.257	.273	.333	.941	.348
	LK	.342	.347	.395	.986	.325
	RAB	.126	.292	.182	.431	.667
	PMPEI	-.024	.062	-.226	-.385	.701
	PMPLK	-.061	.076	-.532	-.802	.424
	PMPRAB	-.014	.062	-.132	-.229	.819

It is observed from the findings of hierarchical multiple regression analysis, provided in Table 1, model 1 is significant as p- value is < .001 which is less than level of significant level ($\alpha = 5\%$). In the second model, only PMP and EI are accepted at p - value of <.05 while LK and RAB concede no significant moderation effect on sustainable construction. As can be seen in model 3, project management has substantial influence on sustainable practices, meanwhile, it can be concluded as the economic issues, lack of knowledge and reluctant attitude/behaviour have no significant moderation on the project management practices in the sustainable construction industry in the UK context.

Qualitative Research Findings: ISM Modelling

For qualitative research approach, the data was analysed in SmartISM software applying ISM technique with Matrice d' Impacts Croises Multiplication Applique a Classement (MICMAC) analysis. Table 2 presents the demographic information of the participants.

Table 2. Demographic Information of the Participants

	Role	**Experience**	**Education**
1	Senior BIM Engineer	9 years	MSc in construction project management
2	Academic Researcher	6 years	MSc in project management
3	Site Engineer	9 years	MSc in construction project management
4	Academic Researcher	10 years	MSc in construction project management
5	Academic Researcher	5 years	MSc in construction project management
6	Academic Researcher	7 years	BE (civil)
7	Site Engineer	8 years	BE (civil)

The Structural Self-Interaction Matrix (SSIM), as presented in Table 3, was created incorporating experts' expertise and knowledge to determine the contextual interactions between the considered factors.

Table 3. Structural Self-Interaction Matrix (SSIM)

Code	**Variables**	1	2	3	4	5	6
1	Project Management Practices		V	A	A	A	X
2	Green Technology			X	A	A	A
3	Economic Issues				A	A	X
4	Lack of knowledge					X	V
5	Reluctant Attitude/Behaviour						V
6	Sustainable Practices						

The next step is to develop an initial and final reachability matrix from SSIM shown in Table 4 and 5, respectively. The Structural Self-Interaction Matrix (SSIM) is represented in binary form, where the four symbols (V, A, X, and O) are substituted by 1, 0, 1, and 0 numbers, respectively. Since it is believed that each building influences itself, 1s are positioned diagonally.

Table 4. Initial Reachability Matrix (RM)

Variables	1	2	3	4	5	6	**Driving Power**
1	1	1	0	0	0	1	3
2	0	1	1	0	0	0	2
3	1	1	1	0	0	1	4
4	1	1	1	1	1	1	6
5	1	1	1	1	1	1	6
6	1	1	1	0	0	1	4
1	5	6	5	2	2	5	

Table 5. Final Reachability Matrix (FRM)

Variables	1	2	3	4	5	6	**Driving Power**
1	1	1	1*	0	0	1	4
2	1*	1	1	0	0	1*	4
3	1	1	1	0	0	1	4
4	1	1	1	1	1	1	6
5	1	1	1	1	1	1	6
6	1	1	1	0	0	1	4
1	6	6	6	2	2	6	

The resultant matrix is known as FRM, and the transitive relations that were detected are represented in the RM with 1*s to differentiate from original 1s. The driving and reliance powers of each variable in the FRM are likewise calculated by counting 1s and 1*s in rows and columns, respectively. For each factor, reachability set, antecedent set and intersection set are derived from FRM, and the levels of the factors are determined as provided in the above Table 6. Variables with the same reachability and intersection sets are given the highest rank and are discarded for the next iteration, and the operation is repeated until all variables have been rated.

Table 6. Level Partitioning (LP)

Elements (Mi)	Reachability Set R(Mi)	Antecedent Set A(Ni)	Intersection Set R(Mi)∩A(Ni)	Level
1	1, 2, 3, 6,	1, 2, 3, 4, 5, 6,	1, 2, 3, 6,	1
2	1, 2, 3, 6,	1, 2, 3, 4, 5, 6,	1, 2, 3, 6,	1
3	1, 2, 3, 6,	1, 2, 3, 4, 5, 6,	1, 2, 3, 6,	1
4	4, 5,	4, 5,	4, 5,	2
5	4, 5,	4, 5,	4, 5,	2
6	1, 2, 3, 6,	1, 2, 3, 4, 5, 6,	1, 2, 3, 6,	1

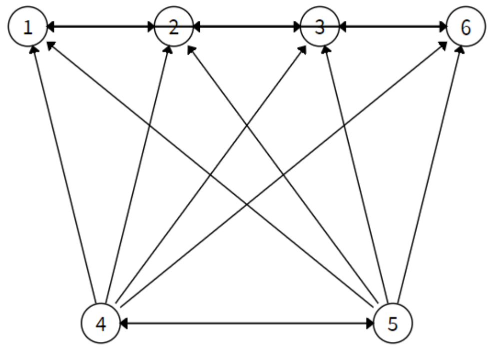
Looking at Table 6, project management practices (1), green technology (2), economic issues (3) and sustainable practices (6) designated at Level 1 while lack of knowledge (4) and reluctant attitude/behaviour (5) fell at level 2.

Table 7. Conical Matrix (CM)

Variables	1	2	3	6	4	5	Driving Power	Level
1	1	1	1*	1	0	0	4	1
2	1*	1	1	1*	0	0	4	1
3	1	1	1	1	0	0	4	1
6	1	1	1	1	0	0	4	1
4	1	1	1	1	1	1	6	2
5	1	1	1	1	1	1	6	2
Dependence Power	6	6	6	6	2	2		
Level	1	1	1	1	2	2		

In Conical Matrix (Table 7), the variables are organised across the columns and rows according to their respective levels, and also the matrix assists in creating the diagraph of the variables' hierarchical structure. The obtained levels of the six variables assists in the development of the hierarchical structure of variables described in Figure 1.

Matrice d' Impacts Croises Multiplication Applique a Classement (MICMAC) analysis is conducted to investigate the dependence and drive power of the variables (Kannan, Pokharel and Kumar, 2009) and they are divided into four categories: autonomous, linkage, dependent and independent variables. Figure 2 indicates that neither autonomous nor dependent variables were determined throughout the analysis of this research. Lack of knowledge (4) and reluctant attitude/behaviour (5) were classified as independent variables with high driving and low dependence power for this research. Whereas project management practices (1), green technology (2), economic issues (3) and sustainable practices (6) were identified under linkage variables with high driving and dependence power.



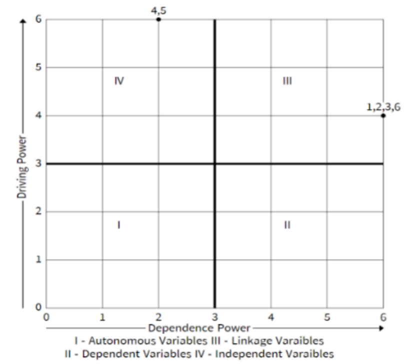


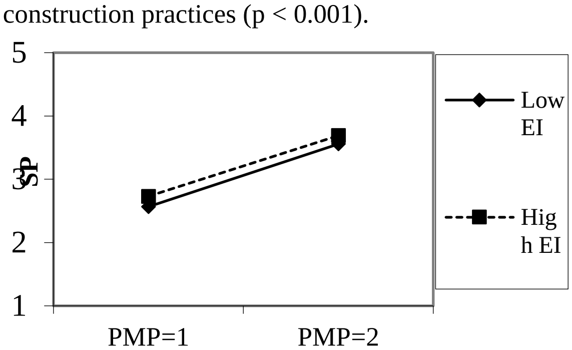
Figure 1. Digraph of ISM Model **Figure 2.** Driving-Dependence Diagram (MICMAC Analysis)

Given the results in MICMAC analysis shown in Figure 2, green technology fell in linkage cluster with high driving and dependence power. It was accepted as highly unstable that its implementation must be well managed for the development to be effective.

Discussion

Effect of Economic Issues in Adoption of Sustainable Construction Practices

In any construction projects, economy is one of the most challenging issues in the sector. Similarly, sustainable construction projects may have economic issues regarding sustainable practices and technologies (Djokoto, Dadzie and Ohemeng-Ababio, 2014). Based on previous studies and researches, economy could have moderated influence on the project management practices and sustainable construction. The studies by Jackson (2002) specified that budgets are frequently overrun on most projects. Also, the bivariate correlation analysis indicates that a high correlation is found between economic challenges and sustainable construction practices ($r = 0.638$, $p < 0.001$).
In Table 1, the result in model 2 shows that economic issues are associated with sustainable construction practices ($p < 0.001$).



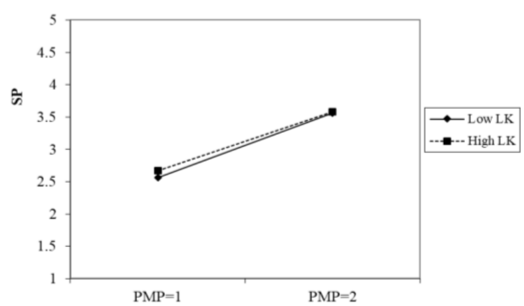


Figure 3. Moderating effect of EI on the PMP-SP **Figure 4.** Moderating effect of LK on the PMP-SP

However, the result from model 3 indicates that the relationship between economic issues and project management practices is not significant in UK construction industry. It may be concluded that against expectations, economic difficulties are not an important hindrance to the adoption of sustainable practises in the UK construction sector. Furthermore, the researcher used Jeremy Dawson Plot (Dawson, 2014), to interpret the relationship between project management procedures and sustainable practices as it differs with the level of economic activity. Based on the results from regression analysis, Figure 3 demonstrates that the relationship between PMP and SP is always positive and EI has a slight impact on them. It Figures that, despite the potential benefits of using advanced project management techniques in establishing a more environmentally sustainable building industry, the organisations involved are likely to encounter financial difficulties.

Effect of Lack of Knowledge in Adoption of Sustainable Construction Practices

Many construction experts are not skilled in the latest technologies, products, and techniques associated with sustainable practices; this is one of the major challenges to their adoption (Bashir et al., 2010). Consequently, traditional construction methods may continue to be utilized that are less sustainable and more environmental damaging. So, a lack of knowledge poses a significant challenge to sustainable construction practises. Hierarchical multiple regression analysis was conducted to ascertain the impact that a lack of knowledge has on the adoption of sustainable construction methods. It can be examined that there is a moderate relationship between lack of knowledge and sustainable construction practices ($r = 0.551$, $p < 0.01$). In addition, for model 2 in Table 1, lack of knowledge is not a significant factor in adoption of sustainable construction practices and also, model 3 shows that the relation of lack of knowledge with project management procedures is not a significant risk in UK sustainable construction sector. Besides, Figure 4 shows that there are slight differences between the slopes of the lines, but the relationship between PMP and SP remains positive. However, organisations need to be proactive in addressing knowledge gaps and encouraging the adoption of sustainable practises as the factor is at the low level in ISM model. Organisations may find it beneficial to overcome knowledge gaps and strengthen their capacity to apply sustainable practises through organising staff training and knowledge-sharing conferences (Mohajan, 2019).

Effect of Reluctance in Adoption of Sustainable Construction Practices

Many construction stakeholders may lack the appropriate expertise or competencies to effectively utilise sustainable construction practises (Ametepey, Aigbavboa and Ansah, 2012). This can lead to uncertainty about the feasibility and effectiveness of certain practises. Furthermore, stakeholders in this industry may be unwilling to adopt sustainable construction practises if there is no major demand from clients or the market. The conclusion drawn from the survey data is that reluctance in attitude and behaviour has a poor relation with sustainable approaches. On top of that, the second model in Table 1 shows that reluctance is not a significant component in the introduction of sustainable practices as well as the third model reveals that resistance towards project management practices is not a major concern in the UK construction organizations. It is implying that individuals in industry are aware of a growing demand for sustainable construction projects.

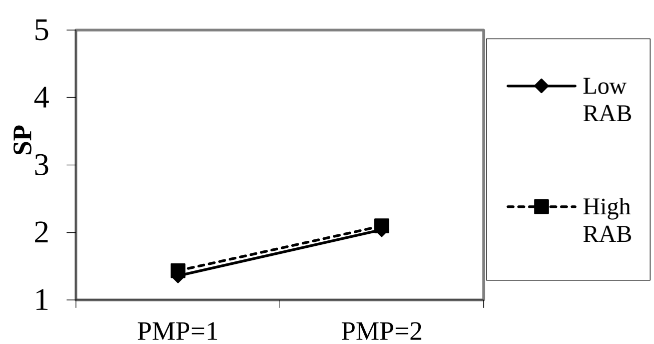


Figure 5. Moderating effect of RAB on the PMP-SP relationship

In Figure 5, the result shows that the effect of PMP on SP is far more modest for individuals with high RAB than for those with low RAB. Reluctance, however, is at a low level in the ISM model, indicating that if it is not adequately monitored, it might be a significant obstacle. Even though this study's findings indicate that resistance is not a major issue in UK sustainable building projects, resistance to the adoption of sustainable practises must be overcome through collaborative efforts from all industry participants.

Conclusion

Based on the conceptual framework, the researcher conducted this study through mixed research approach. Moreover, this study observed that the moderating factors from the conceptual framework are not significant barriers to the introduction of sustainability in UK construction sector. The investigation shows that although economic issues are correlated to the sustainable practices, it is not a great threat to the adoption of sustainable practices. The findings of the research suggest that lacking in awareness of sustainability procedures is significantly affected in the management of sustainable construction projects. It appears that organizations can address knowledge gaps and promote the adoption of sustainable practices by offering workshops and knowledge-sharing conferences by fostering a positive relationship between project management procedures and sustainable practices. Also based on the results from Table 1, reluctance has not been a significant factor in the introduction of sustainable practices in UK construction organizations. However, it is still important for organizations to address any workforce resistance. In conclusion, sustainable practices can be adopted in the UK construction industry without major obstacles as long as everyone participate in the process. In ISM approach, the technique can become complicated when the number of variables increase in a problem or issue. Moreover, the questions used to collect data during the panel interview are complicated, requiring individual explanation. Overall, the research's limitations create a foundation for future research to investigate the variables impacting the adoption of sustainable practices in the construction industry in UK.

References

Aghimien, D. O., Aigbavboa, C. O., & Thwala, W. D. (2019). Microscoping the challenges of sustainable construction in developing countries. *Journal of Engineering, Design and Technology, 17*(6), 1110–1128.

Bashir, A. M., Suresh, S., Proverbs, D. G., & Gameson, R. (2010). Barriers towards the sustainable implementation of lean construction in the United Kingdom construction organisations. *ARCOM Doctoral Workshop.*

Chreim, S. (2007). Managerial frames and institutional discourses of change: Employee appropriation and resistance. *Organization Studies, 27,* 1261–1287.

Cruz, C. O., Gaspar, P., & de Brito, J. (2019). On the concept of sustainable sustainability: An application to the Portuguese construction sector. *Journal of Building Engineering, 25,* 100836.

Darko, A., Chan, A. P. C., Ameyaw, E. E., He, B.-J., & Olanipekun, A. O. (2017). Examining issues influencing green building technologies adoption: The United States green building experts' perspectives. *Energy and Buildings, 144,* 320–332.

Dawson, J. F. (2014). Moderation in management research: What, why, when, and how. *Journal of Business and Psychology, 29*(1), 1–19.

Djokoto, S. D., Dadzie, J., & Ohemeng-Ababio, E. (2014). Barriers to sustainable construction in the Ghanaian construction industry: Consultants perspectives. *Journal of Sustainable Development, 7*(1), 134.

Fiedler, S. (2010). Managing resistance in an organizational transformation: A case study from a mobile operator company. *International Journal of Project Management, 28,* 370–383.

Hwang, B., & Tan, J. S. (2012). Sustainable project management for green construction: Challenges, impact and solutions.
Hussin, J. M., Rahman, I. A., & Memon, A. H. (2013). The way forward in sustainable construction: Issues and challenges. *International Journal of Advances in Applied Sciences, 2*(1), 15–24.
Jackson, S. (2002). Project cost overruns and risk management. In *Proceedings of Association of Researchers in Construction Management 18th Annual ARCOM Conference* (pp. 1–10). Newcastle, Northumbria University, UK.
Kannan, G., Pokharel, S., & Kumar, P. S. (2009). A hybrid approach using ISM and fuzzy TOPSIS for the selection of reverse logistics provider. *Resources, Conservation and Recycling, 54*(1), 28–36.
Kumar, R., & Goel, P. (2022). Exploring the domain of interpretive structural modelling (ISM) for sustainable future panorama: A bibliometric and content analysis. *Archives of Computational Methods in Engineering, 29*(5), 2781–2810.
Maqbool, R., Saiba, M. R., & Ashfaq, S. (2025). Organisational innovation performance and sustainable development: Fostering a constructing context of project management practices and integrated approaches. *Sustainable Development.*
Misopoulos, F., Manthou, V., Michaelides, Z., & Adebayo, A. (2021). Environmental and social sustainability in UK construction industry: A systematic literature review.
Mohajan, H. K. (2019). Knowledge sharing among employees in organizations. *Journal of Economic Development, Environment and People, 8*(1), 52–61.
Newman, C., Edwards, D., Martek, I., Lai, J., Thwala, W. D., & Rillie, I. (2021). Industry 4.0 deployment in the construction industry: A bibliometric literature review and UK-based case study. *Smart and Sustainable Built Environment, 10*(4), 557–580.
Onwueme, I., & Borsari, B. (2007). The sustainability asymptogram: A new philosophical framework for policy, outreach and education in sustainability. *International Journal of Sustainability in Higher Education, 8*(1), 44–52.
Opoku, A., & Ahmed, V. (2015). *Leadership and sustainability in the built environment.* Taylor and Francis.
Saunders, M., Lewis, P., & Thornhill, A. (2007). *Research methods for business students* (4th ed.). Pearson Education Limited.
Sarhan, S., & Fox, A. (2013). Barriers to implementing lean construction in the UK construction industry. *The Built & Human Environment Review.*
Willar, D., Waney, E. V. Y., Pangemanan, D. D. G., & Mait, R. E. G. (2021). Sustainable construction practices in the execution of infrastructure projects: The extent of implementation. *Smart and Sustainable Built Environment, 10*(1), 106–124.
Zhang, X., Shen, L., & Wu, Y. (2011). Green strategy for gaining competitive advantage in housing development: A China study. *Journal of Cleaner Production, 19*(2–3), 157–167.
Zhou, L., & Lowe, D. J. (2003). Economic challenge of sustainable construction. In *Proceedings of the RICS Construction and Building Research Conference* (pp. 113–126). School of Engineering and the Built Environment.