Evaluating the Effectiveness of an MS Project Webinar in Enhancing Construction Students' Digital Scheduling Awareness, Perceived Usefulness, and Future Industry Readiness

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ABSTRACT

This study examines how an MS Project webinar helped final-year students improve their awareness of digital scheduling and understand its relevance to future construction practice. With digital project management becoming increasingly important in construction education, the study focused on students' scheduling awareness, the challenges they faced in learning or applying MS Project, and their views on the effectiveness of the webinar. A quantitative cross-sectional survey was conducted with 69 usable responses from 106 final-year students involved in an Infrastructure Design Project-related learning setting. The data were analysed using SmartPLS through measurement and structural model assessments. The results showed strong reliability, internal consistency, and convergent validity in the measurement model, although some HTMT values indicated that scheduling awareness, perceived usefulness, and future industry demand were closely related. In the structural model, project scheduling awareness and the effectiveness of the webinar had a significant effect on students' perceived usefulness of MS Project. However, learning and implementation challenges did not have a significant influence. The strongest finding was that students who found MS Project useful were also more likely to believe that digital scheduling skills would be important in the construction industry. At the same time, perceived usefulness did not significantly affect the overall webinar rating, suggesting that students' satisfaction may also depend on factors such as delivery style, interaction, and engagement. Overall, the findings suggest that webinar-based technical exposure can help build digital construction readiness, but stronger competence requires hands-on practice, guided software activities, and closer integration with project-based learning.

Keywords: MS Project; Construction Management Education; Digital Scheduling Awareness; Perceived Usefulness; Future Industry Readiness

INTRODUCTION

The construction industry is undergoing a major digital shift. Today, project managers are expected not only to understand planning concepts, but also to use digital tools for scheduling, monitoring, coordination, and data-based decision-making. In Malaysia, this direction is clearly reflected in the Construction 4.0 Strategic Plan 2021–2025, which highlights digital technology adoption and a future-ready workforce as key drivers of productivity, competitiveness, quality, safety, and sustainability in the national construction sector (CIDB, 2020). A similar trend can be seen globally. The World Economic Forum reports that employers expect 39% of workers' core skills to change by 2030, with digital literacy and technology-related skills becoming more important across many industries (Forum, 2025). For construction management education, this creates a practical challenge. Students may understand the theory of scheduling, work sequencing, and project control, but still feel unsure when applying these ideas through industry-relevant software. This gap matters because construction projects continue to face delays, cost escalation, poor coordination, and limited project visibility. Recent

discussions on construction productivity also stress that better planning, digital workflows, and stronger project control are now necessary for improving project delivery performance (Andersson et al., 2020)(Mischke et al., 2024). Within this context, Microsoft Project remains a useful teaching tool. It helps students visualise work breakdown structures, task dependencies, Gantt charts, milestones, baseline tracking, and resource planning. In this way, it links classroom learning with actual project management practice. Recent studies and professional training contexts also show that Microsoft Project is still used in construction scheduling, planning, and cost-related project control because it helps turn manual scheduling into a more structured and trackable process (Al-Dhamad et al., 2025). However, students' acceptance of this type of software should not be assumed. Studies on technology-enhanced learning show that perceived usefulness can influence learners' attitudes, motivation, and intention to use digital learning systems (Syari'Ati Fathimah et al., 2024)(Wu et al., 2023).. For this reason, evaluating an MS Project webinar based only on general satisfaction may not fully explain its educational value. It is also important to examine whether students' scheduling awareness, perceived usefulness of MS Project, learning challenges, and views on talk effectiveness are related to their future industry readiness. Accordingly, this study investigates the effectiveness of an MS Project webinar in enhancing development students' digital scheduling awareness, perceived usefulness, and future industry readiness. Using PLS-SEM, the study explains how webinar-based technical exposure may contribute to students' preparedness for digitally supported construction management practice.

LITERATURE REVIEW

Digital scheduling competence is becoming an important part of construction management education. Modern construction projects are no longer managed through planning theory alone. They increasingly depend on digital workflows, real-time monitoring, and data-supported coordination. In Malaysia, this direction aligns with the Construction 4.0 agenda, which emphasises digital transformation, disruptive technologies, and workforce readiness as key elements in improving the competitiveness and performance of the construction sector (CIDB, 2020). The same need is reflected in wider industry discussions, where construction productivity is often linked to fragmented delivery systems, project complexity, and slow technology adoption. As a result, better planning systems and digital project-control practices are now seen as necessary for improving construction performance (Mischke et al., 2024). In this context, project scheduling tools such as Microsoft Project remain useful in construction education. They help students translate abstract concepts such as work breakdown structure, task sequencing, dependencies, calendars, milestones, and resource planning into schedules that can be seen, adjusted, and managed. Recent construction-related applications also show that Microsoft Project can support planning, scheduling, critical path identification, and resource allocation in building projects. This makes it a practical tool for connecting classroom learning with construction-site decision-making (Al-Dhamad et al., 2025). However, the value of digital tools in education depends on more than simply giving students access to the software. Students also need to be ready to understand, accept, and apply the tool in a meaningful way. Studies on digital skills in construction suggest that the industry now requires a wider range of digital competencies, but adoption remains uneven because awareness, training, and hands-on exposure are still developing (Siddiqui et al., 2023). Similarly, research on experiential learning in construction management education shows that students respond more positively to digital tools when learning activities go beyond explanation and help them see how the technology supports real project tasks (Said & Yussof, 2023). This point is especially relevant for webinar-based technical learning. Webinars can give students flexible access to technical knowledge and industry-related exposure, but their effectiveness should not be measured only through satisfaction scores. A more useful evaluation should consider students' scheduling awareness, perceived usefulness of the tool, learning challenges, and views on its future industry relevance. Studies on technology acceptance in higher education consistently show that perceived usefulness strongly influences students' attitudes and intention to use educational technologies, especially when they believe the tool can improve their understanding, performance, or professional competence (Al-Adwan et al., 2023)(Syari'Ati Fathimah et al., 2024). Therefore, in the context of an MS Project webinar for construction students, perceived usefulness acts as an important link between technical exposure and future readiness. When students recognise that MS Project can help them understand scheduling, monitoring, and project control, they are more likely to see digital scheduling competence as relevant to employability and professional practice. At the same time, learning challenges such as limited prior exposure, difficulty understanding project logic, unfamiliarity with software functions, and limited practice time may influence how students respond to the tool. For this reason, the present

study evaluates webinar effectiveness beyond general feedback. It examines how project scheduling awareness, perceived usefulness, learning challenges, and talk effectiveness interact in shaping students' future industry readiness. This approach gives a clearer contribution to construction management education by treating the webinar not only as a single academic activity, but also as a bridge between university learning and the digital competencies expected in construction practice.

Conceptual Framework and Hypotheses

The conceptual framework of this study is based on the idea that students' readiness to use digital scheduling tools depends not only on exposure to the software, but also on how useful, meaningful, and relevant they find the learning experience. In construction management education, this is important because digital scheduling competence is increasingly linked to graduate employability, project coordination, and future productivity. Recent studies on construction digital skills also highlight the need for stronger technical and applied digital competencies among future professionals(Jiang et al., 2025). In this study, Project Scheduling Awareness is treated as an antecedent of Perceived Usefulness of MS Project. Students who understand scheduling concepts such as task sequencing, dependencies, milestones, progress monitoring, and resource planning are more likely to recognise the practical value of MS Project as a construction management tool. This is consistent with technology acceptance research, where perceived usefulness is often used to explain whether learners accept and value educational technologies (Barz et al., 2024)(Kemp et al., 2024). Talk Effectiveness is also expected to influence perceived usefulness. A clear and well-delivered webinar can help students connect MS Project functions with real construction practice, rather than seeing the software as only a technical tool. Learning and Implementation Challenges are also included in the framework because students may face issues such as limited software experience, difficulty understanding scheduling logic, or low confidence in using digital tools. These challenges may affect how useful they perceive MS Project to be. This reflects recent technology-enhanced learning studies, which show that digital tool acceptance is shaped by factors such as prior experience, self-efficacy, digital readiness, and perceived barriers (Sasongko et al., 2025). The framework also proposes that Perceived Usefulness of MS Project influences Future Industry Demand. Students who believe MS Project improves their scheduling and monitoring knowledge are more likely to see digital scheduling skills as important for future construction careers. Perceived usefulness is also expected to influence Overall Rating, as students may give a stronger evaluation of the webinar when they see clear academic and professional value in it. Based on this framework, five hypotheses are proposed: H1: Project Scheduling Awareness has a positive effect on Perceived Usefulness of MS Project; H2: Talk Effectiveness has a positive effect on Perceived Usefulness of MS Project; H3: Learning and Implementation Challenges have a significant effect on Perceived Usefulness of MS Project; H4: Perceived Usefulness of MS Project has a positive effect on Future Industry Demand; and H5: Perceived Usefulness of MS Project has a positive effect on Overall Rating. PLS-SEM is suitable for this study because it examines predictive relationships among latent perception-based constructs, which is common in education, technology acceptance, and exploratory behavioural research.

METHODOLOGY

This study used a quantitative cross-sectional survey design to evaluate the effectiveness of an MS Project webinar in improving construction students' digital scheduling awareness, perceived usefulness, and future industry readiness. The study population consisted of 106 final-year students involved in an Infrastructure Design Project-related learning context. Of these, 69 students provided usable responses, giving a response rate of about 65.1%. Data were collected through a structured questionnaire administered after the webinar. This allowed the study to capture students' immediate views on the learning experience. The questionnaire included demographic items and six main constructs: Project Scheduling Awareness, Perceived Usefulness of MS Project, Learning and Implementation Challenges, Future Industry Demand, Talk Effectiveness, and Overall Rating. The construct items were measured using a five-point Likert scale, which is suitable for perception-based educational and technology-adoption studies. PLS-SEM was used because the study aimed to examine predictive relationships among latent constructs rather than simply compare group differences. It is also suitable for exploratory, prediction-focused models with complex relationships and relatively modest sample sizes(Ringle et al., 2023)(Ringle & Sarstedt, 2021). The analysis was conducted using SmartPLS. It began with descriptive statistics to summarise respondents' profiles and construct-level trends, followed by measurement model

assessment and structural model testing. For the reflective measurement model, indicator reliability was assessed using outer loadings, internal consistency using Cronbach's alpha and composite reliability, convergent validity using average variance extracted, and discriminant validity using HTMT. Commonly applied thresholds include 0.70 for outer loadings and reliability measures, and 0.50 for AVE, while HTMT is commonly used to assess discriminant validity among reflective constructs. After confirming the measurement model, the structural model was assessed using collinearity diagnostics, path coefficients, coefficient of determination, effect size, and predictive relevance. Bootstrapping was applied to test the significance of the hypothesised relationships, as it is a non-parametric procedure commonly used in SmartPLS to assess path coefficients (Joseph F. Hair et al., 2022). The adequacy of the sample size was also considered in relation to PLS-SEM recommendations. This was important because sample size estimation is a recognised issue in PLS-based modelling, and Kock and Hadaya's inverse square root and gamma-exponential approaches are often cited as stronger alternatives to simple rules of thumb (Ringle et al., 2023)(Kock & Hadaya, 2018)

DATA ANALYSIS AND RESULTS

Respondents' Demographic Profile

Table1: Demographic Profile and Prior Exposure of Respondents

Item	Description		N	%
A1	Gender	Male	31	44.9%
		Female	38	55.1%
A2	Group	Student	64	92.8%
		Lecturer	5	7.2%
A3	Have you used MS Project before?	Yes	67	97.1%
		No	1	1.4%
		Not sure	1	1.4%
A4	Have you been exposed to project scheduling in your course?	Yes	60	87.0%
		Partially	9	13.0%

Table 1 presents the demographic profile and prior exposure of the respondents involved in the study. A total of 69 respondents participated, with female respondents forming a slightly higher proportion at 55.1% compared with male respondents at 44.9%. In terms of respondent category, the sample was largely made up of students, representing 92.8%, while lecturers accounted for 7.2%. This indicates that the findings mainly reflect students' perspectives, which is appropriate because the study focuses on construction students' learning experience and readiness after attending the MS Project webinar. The table also shows that most respondents had already used MS Project before, with 97.1% answering "Yes", while only 1.4% answered "No" and another 1.4% were unsure. This suggests that the respondents had a basic level of familiarity with the software, which may help them evaluate its usefulness more meaningfully. In addition, 87.0% of the respondents had been exposed to project scheduling in their course, while 13.0% reported partial exposure. Overall, Table 1 shows that the respondents were highly relevant to the study because most of them were students with prior exposure to both MS Project and project scheduling, making them suitable participants for evaluating the effectiveness of the webinar in strengthening digital scheduling awareness and future industry readiness.

Descriptive Statistics of Constructs

Table2: Descriptive Statistics of the Main Constructs

Construct	Mean	Standard Deviation	Interpretation
Project Scheduling Awareness	4.5014	0.53974	High
Perceived Usefulness of MS Project	4.5043	0.54081	High
Learning Challenges	4.0928	0.78259	High
Future Industry Demand	4.4812	0.57529	High
Talk Effectiveness	4.4638	0.56307	High
Overall Rating	4.7754	0.44172	High

Table 2 summarises the descriptive statistics for the main constructs measured in the study. Overall, all constructs recorded high mean scores, ranging from 4.0928 to 4.7754, indicating that respondents generally held positive perceptions of the MS Project webinar and its relevance to construction management learning. The highest mean was recorded for Overall Rating (M = 4.7754, SD = 0.44172), suggesting that respondents were highly satisfied with the webinar and viewed it favourably as a learning activity. This was followed by Perceived Usefulness of MS Project (M = 4.5043, SD = 0.54081) and Project Scheduling Awareness (M = 4.5014, SD = 0.53974), showing that students strongly agreed that MS Project is useful and that the webinar supported their awareness of digital scheduling and monitoring practices. Future Industry Demand also recorded a high mean score (M = 4.4812, SD = 0.57529), suggesting that respondents recognised the importance of MS Project and digital scheduling skills for future construction-related careers. Similarly, Talk Effectiveness achieved a high mean score (M = 4.4638, SD = 0.56307), indicating that the webinar delivery was perceived as clear, relevant, and beneficial. Although Learning Challenges recorded the lowest mean (M = 4.0928, SD = 0.78259), it was still interpreted as high, implying that respondents acknowledged the presence of learning or implementation challenges, such as software familiarity or technical application, even while recognising the value of MS Project. Overall, Table 2 suggests that the webinar was positively received and that students perceived MS Project as useful, relevant, and important for strengthening their digital scheduling readiness.

Measurement Model Assessment

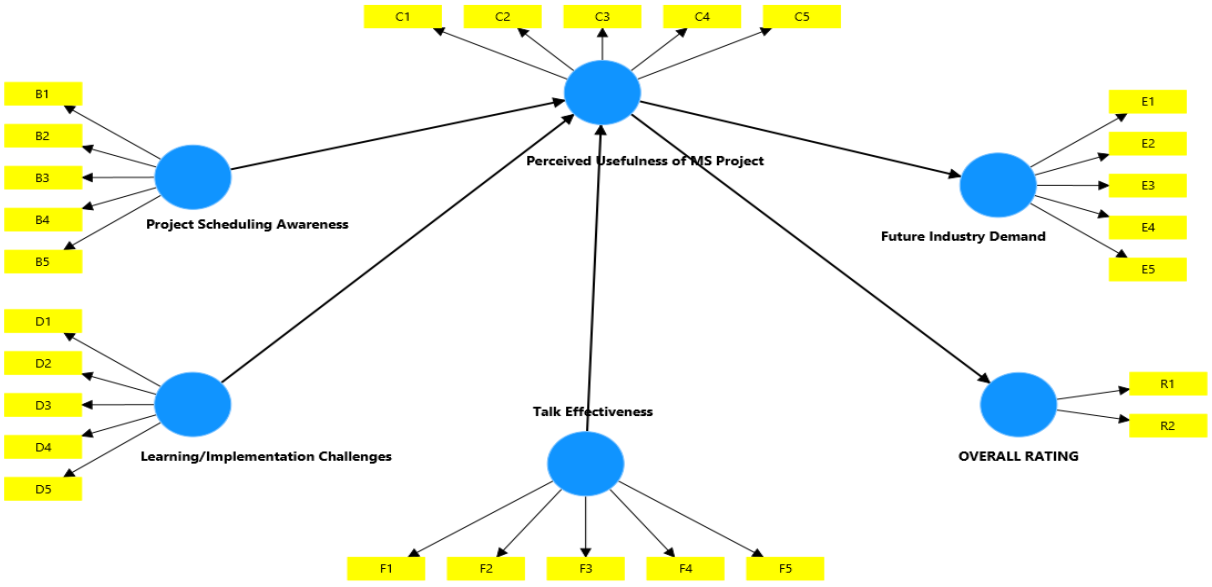

Figure 1. Assessment model

Figure 1 illustrates the proposed SmartPLS assessment model used to examine the effectiveness of the MS Project webinar. The model shows Perceived Usefulness of MS Project as the central construct, influenced by three predictor constructs: Project Scheduling Awareness, Learning/Implementation Challenges, and Talk Effectiveness. It then links perceived usefulness to two outcome constructs, namely Future Industry Demand and Overall Rating. This structure suggests that the study does not only evaluate whether students liked the webinar, but also examines whether their awareness of scheduling, perceived challenges, and perception of the talk's effectiveness can explain how useful they found MS Project and whether this usefulness contributes to their future industry readiness. Overall, Figure 1 provides a clear visual basis for testing the hypothesised relationships using PLS-SEM.

Indicator Reliability

Table 3: Indicator Reliability Based on Outer Loadings

Item/Construct	**Outer loadings**	**Decision (Retained / Removed)**
B1 <- Project Scheduling Awareness	0.919	Retained
B2 <- Project Scheduling Awareness	0.888	Retained
B3 <- Project Scheduling Awareness	0.955	Retained
B4 <- Project Scheduling Awareness	0.944	Retained
B5 <- Project Scheduling Awareness	0.958	Retained
C1 <- Perceived Usefulness of MS Project	0.945	Retained
C2 <- Perceived Usefulness of MS Project	0.934	Retained
C3 <- Perceived Usefulness of MS Project	0.931	Retained
C4 <- Perceived Usefulness of MS Project	0.928	Retained
C5 <- Perceived Usefulness of MS Project	0.94	Retained
D1 <- Learning/Implementation Challenges	0.82	Retained
D2 <- Learning/Implementation Challenges	0.925	Retained
D3 <- Learning/Implementation Challenges	0.92	Retained
D4 <- Learning/Implementation Challenges	0.931	Retained
D5 <- Learning/Implementation Challenges	0.917	Retained
E1 <- Future Industry Demand	0.954	Retained
E2 <- Future Industry Demand	0.94	Retained
E3 <- Future Industry Demand	0.955	Retained
E4 <- Future Industry Demand	0.93	Retained
E5 <- Future Industry Demand	0.951	Retained
F1 <- Talk Effectiveness	0.938	Retained
F2 <- Talk Effectiveness	0.924	Retained

F3 <- Talk Effectiveness	0.966	Retained
F4 <- Talk Effectiveness	0.923	Retained
F5 <- Talk Effectiveness	0.961	Retained
R1 <- OVERALL RATING	0.788	Retained
R2 <- OVERALL RATING	0.983	Retained

Table 3 reports the indicator reliability of all measurement items based on their outer loadings. Overall, the results show a very strong measurement model because all items exceeded the recommended minimum loading value of 0.708 and were therefore retained. The items for Project Scheduling Awareness loaded strongly, ranging from 0.888 to 0.958, indicating that B1 to B5 consistently measured students' awareness of scheduling and digital monitoring. Similarly, Perceived Usefulness of MS Project showed highly stable loadings between 0.928 and 0.945, suggesting that students responded consistently to items measuring the usefulness of MS Project in supporting construction scheduling learning. The items for Learning/Implementation Challenges also performed well, with loadings from 0.820 to 0.931, showing that the construct was reliably captured despite reflecting a more challenging aspect of students' learning experience. Future Industry Demand and Talk Effectiveness demonstrated particularly strong indicator reliability, with all loadings above 0.923, suggesting that respondents clearly recognised the professional relevance of MS Project and the effectiveness of the webinar delivery. For Overall Rating, R1 and R2 also met the required threshold, with loadings of 0.788 and 0.983, respectively. In brief, Table 3 confirms that all indicators were statistically adequate and conceptually meaningful, meaning that no item needed to be removed before proceeding to the reliability, validity, and structural model assessment.

Internal Consistency Reliability and Convergent Validity

Table 4: Construct Reliability and Convergent Validity Assessment

Construct	**Cronbach's alpha**	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**	**Average variance extracted (AVE)**	**Decision**
Future Industry Demand	0.971	0.971	0.977	0.895	Acceptable
Learning/Implementation Challenges	0.944	0.971	0.957	0.817	Acceptable
OVERALL RATING	0.798	1.804	0.884	0.794	Acceptable
Perceived Usefulness of MS Project	0.964	0.965	0.972	0.875	Acceptable
Project Scheduling Awareness	0.963	0.968	0.971	0.871	Acceptable
Talk Effectiveness	0.969	0.971	0.975	0.888	Acceptable

The results in Table 4 indicate that the measurement model achieved strong internal consistency reliability and convergent validity across all constructs. The Cronbach's alpha values ranged from 0.798 to 0.971, showing that the items within each construct were generally consistent in measuring the same underlying concept. The composite reliability values were also above the recommended threshold of 0.70, confirming that the constructs demonstrated satisfactory reliability. More importantly, all Average Variance Extracted (AVE) values exceeded the minimum criterion of 0.50, ranging from 0.794 to 0.895, which suggests that each construct explained a substantial proportion of variance in its indicators. As shown in Table 4, Future Industry Demand recorded the highest AVE value (0.895), followed closely by Talk Effectiveness (0.888), Perceived Usefulness of MS Project (0.875), and Project Scheduling Awareness (0.871), indicating very strong convergent validity for the core constructs of the study. Although the Overall Rating construct showed an unusual rho_a value of 1.804, which

may require checking in SmartPLS output or item coding, its Cronbach's alpha, composite reliability, and AVE remained within acceptable ranges. Overall, the findings suggest that the constructs were statistically reliable and conceptually stable, providing sufficient confidence to proceed with discriminant validity and structural model assessment.

Discriminant Validity

Table 5: Discriminant Validity Assessment Using the HTMT Criterion

Construct Relationship	**Heterotrait-monotrait ratio (HTMT)**	**Decision**
Learning/Implementation Challenges <-> Future Industry Demand	0.388	Acceptable
OVERALL RATING <-> Future Industry Demand	0.249	Acceptable
OVERALL RATING <-> Learning/Implementation Challenges	0.092	Acceptable
Perceived Usefulness of MS Project <-> Future Industry Demand	0.918	?
Perceived Usefulness of MS Project <-> Learning/Implementation Challenges	0.335	Acceptable
Perceived Usefulness of MS Project <-> OVERALL RATING	0.190	Acceptable
Project Scheduling Awareness <-> Future Industry Demand	0.860	?
Project Scheduling Awareness <-> Learning/Implementation Challenges	0.317	Acceptable
Project Scheduling Awareness <-> OVERALL RATING	0.195	Acceptable
Project Scheduling Awareness <-> Perceived Usefulness of MS Project	0.913	?
Talk Effectiveness <-> Future Industry Demand	0.798	Acceptable
Talk Effectiveness <-> Learning/Implementation Challenges	0.187	Acceptable
Talk Effectiveness <-> OVERALL RATING	0.523	Acceptable
Talk Effectiveness <-> Perceived Usefulness of MS Project	0.842	Acceptable
Talk Effectiveness <-> Project Scheduling Awareness	0.783	Acceptable

The discriminant validity results show that most construct relationships achieved acceptable separation, suggesting that the constructs generally measured distinct aspects of students' webinar experience rather than overlapping excessively. Several HTMT values were clearly below the recommended threshold, including Learning/Implementation Challenges–Future Industry Demand (0.388), Overall Rating–Learning/Implementation Challenges (0.092), Talk Effectiveness–Learning/Implementation Challenges (0.187), and Talk Effectiveness–Overall Rating (0.523), indicating satisfactory discriminant validity among these constructs. However, Table 5 also reveals three relationships that require careful attention: Perceived Usefulness of MS Project–Future Industry Demand (0.918), Project Scheduling Awareness–Perceived Usefulness of MS Project (0.913), and Project Scheduling Awareness–Future Industry Demand (0.860). These values are close to or slightly above the stricter HTMT threshold of 0.85, and two exceed the more liberal threshold of 0.90, suggesting that these constructs are conceptually very close in respondents' perceptions. This is not entirely unexpected, as students who are aware of project scheduling may naturally perceive MS Project as useful and

relevant to future industry demand. Nevertheless, from a Q1-style methodological standpoint, these results should be reported transparently and treated as a potential discriminant validity concern. The constructs may still be retained if they are theoretically justified, but the study should acknowledge that scheduling awareness, perceived usefulness, and future industry demand are strongly connected in this webinar context.

Structural Model Assessment

Collinearity Assessment

Table 6: Collinearity Assessment of the Structural Model

Path	VIF	Decision
Learning/Implementation Challenges -> Perceived Usefulness of MS Project	1.118	No collinearity issue
Perceived Usefulness of MS Project -> Future Industry Demand	1.000	No collinearity issue
Perceived Usefulness of MS Project -> OVERALL RATING	1.000	No collinearity issue
Project Scheduling Awareness -> Perceived Usefulness of MS Project	2.560	No collinearity issue
Talk Effectiveness -> Perceived Usefulness of MS Project	2.392	No collinearity issue

Table 6 presents the collinearity assessment for the structural model, which is important to confirm that the predictor constructs do not overlap excessively before interpreting the path relationships. The results show that all inner VIF values were within the acceptable range, with values between 1.000 and 2.560. Specifically, the VIF values for Project Scheduling Awareness → Perceived Usefulness of MS Project (2.560), Talk Effectiveness → Perceived Usefulness of MS Project (2.392), and Learning/Implementation Challenges → Perceived Usefulness of MS Project (1.118) indicate that the three predictors can be retained in the model without serious multicollinearity concerns. As shown in Table 6, the paths from Perceived Usefulness of MS Project to both Future Industry Demand and Overall Rating each recorded a VIF value of 1.000, suggesting no collinearity issue for these outcome relationships. Overall, the findings confirm that the structural model is statistically stable for hypothesis testing, meaning that the estimated path coefficients are unlikely to be distorted by problematic overlap among the predictor constructs.

Path Coefficient and Hypothesis Testing

Table 7: Path Coefficients and Hypothesis Testing Results

1. Hypothesis	2. Path	3. Original sample (O) β	4. Sample mean (M)	5. Standard deviation (STDEV)	6. T statistics (|O/STDEV|)	7. P values	8. Decision
H1	Project Scheduling Awareness -> Perceived Usefulness of MS Project	0.593	0.575	0.155	3.835	0.000	Supported

H2	Talk Effectiveness -> Perceived Usefulness of MS Project	0.350	0.363	0.155	2.250	0.025	Supported
H3	Learning/Implementation Challenges -> Perceived Usefulness of MS Project	0.079	0.082	0.056	1.414	0.157	Not supported
H4	Perceived Usefulness of MS Project -> Future Industry Demand	0.889	0.890	0.042	21.152	0.000	Supported
H5	Perceived Usefulness of MS Project -> OVERALL RATING	0.209	0.223	0.158	1.321	0.187	Not supported

Table 7 presents the bootstrapping results for the hypothesised relationships in the structural model. Overall, three out of five hypotheses were statistically supported, indicating that the model explains important pathways through which the MS Project webinar shaped students' perceptions. The strongest supported relationship was found between Perceived Usefulness of MS Project and Future Industry Demand ($\beta = 0.889$, $t = 21.152$, $p < 0.001$), suggesting that students who perceived MS Project as useful were much more likely to recognise its relevance for future construction practice. As shown in Table 7, Project Scheduling Awareness also had a significant positive effect on Perceived Usefulness of MS Project ($\beta = 0.593$, $t = 3.835$, $p < 0.001$), while Talk Effectiveness significantly influenced Perceived Usefulness ($\beta = 0.350$, $t = 2.250$, $p = 0.025$). These findings suggest that students' understanding of scheduling concepts and their positive experience of the talk both contributed to how useful they perceived MS Project to be. However, Learning/Implementation Challenges did not significantly influence perceived usefulness ($\beta = 0.079$, $t = 1.414$, $p = 0.157$), indicating that although students acknowledged possible challenges, these challenges did not strongly shape their judgement of the software's usefulness. Similarly, Perceived Usefulness did not significantly predict Overall Rating ($\beta = 0.209$, $t = 1.321$, $p = 0.187$), suggesting that students' general satisfaction with the webinar may have been influenced by other factors such as speaker delivery, content clarity, or event organisation. Overall, the results indicate that the webinar's strongest contribution lies in strengthening students' perceived professional relevance of MS Project, particularly in relation to future industry readiness.

Coefficient of Determination

Table 8: Coefficient of Determination for Endogenous Constructs

Endogenous Construct	**R-square**	**R-square adjusted**	**Interpretation**
Future Industry Demand	0.791	0.787	Substantial
OVERALL RATING	0.044	0.030	Weak
Perceived Usefulness of MS Project	0.835	0.828	Substantial

Table 8 reports the coefficient of determination, which indicates how well the model explains the variance in the endogenous constructs. The results show that Perceived Usefulness of MS Project achieved a substantial explanatory power, with an R^2 value of 0.835 and an adjusted R^2 of 0.828, meaning that project scheduling awareness, talk effectiveness, and learning/implementation challenges collectively explained about 83.5% of the variance in students' perceived usefulness of MS Project. This is a strong result because it suggests that students' perception of usefulness was not random, but was meaningfully shaped by their scheduling awareness and experience of the webinar. As shown in Table 8, Future Industry Demand also recorded a substantial R^2 value of 0.791 and an adjusted R^2 of 0.787, indicating that perceived usefulness alone explained approximately 79.1% of students' views on the future industry relevance of MS Project. In contrast, Overall Rating recorded a weak R^2 value of 0.044, suggesting that perceived usefulness explained only 4.4% of the variation in students' overall rating of the webinar. This implies that while perceived usefulness strongly predicts future industry demand, students' overall rating may be influenced by other experiential factors, such as speaker engagement, clarity of delivery, webinar organisation, interaction, or personal interest. Overall, Table 8 strengthens the study's key

argument that the webinar's main value lies in supporting students' perceived usefulness of MS Project and their recognition of its future industry demand, rather than merely improving overall satisfaction.

Effect Size

Table 9: Effect Size Assessment of Structural Relationships

Relationship	f-square	Effect Size
Learning/Implementation Challenges -> Perceived Usefulness of MS Project	0.034	Small
Perceived Usefulness of MS Project -> Future Industry Demand	3.776	Large
Perceived Usefulness of MS Project -> OVERALL RATING	0.046	Small
Project Scheduling Awareness -> Perceived Usefulness of MS Project	0.834	Large
Talk Effectiveness -> Perceived Usefulness of MS Project	0.31	Medium

Table 9 presents the effect size assessment, which explains the practical strength of each structural relationship beyond statistical significance. The strongest effect was found for Perceived Usefulness of MS Project → Future Industry Demand with an f^2 value of 3.776, indicating a very large effect. This means that students' perception of MS Project as useful played a dominant role in shaping their belief that digital scheduling skills are important for future construction practice. In Table 9, Project Scheduling Awareness → Perceived Usefulness of MS Project also produced a large effect ($f^2 = 0.834$), while Talk Effectiveness → Perceived Usefulness of MS Project showed a medium effect ($f^2 = 0.310$). These results suggest that students' understanding of scheduling concepts had a stronger practical influence on perceived usefulness than the delivery of the talk itself, although the webinar's effectiveness still contributed meaningfully. In contrast, Learning/Implementation Challenges → Perceived Usefulness of MS Project recorded only a small effect ($f^2 = 0.034$), indicating that perceived challenges did not substantially change students' view of MS Project's usefulness. Similarly, Perceived Usefulness → Overall Rating showed a small effect ($f^2 = 0.046$), suggesting that students' general rating of the webinar may depend on other factors beyond usefulness, such as speaker engagement, clarity, interaction, or overall event experience. Overall, Table 9 strengthens the argument that the most important contribution of the webinar lies in connecting MS Project's usefulness to students' future industry readiness.

Predictive Relevance

Table 10: Predictive Relevance Assessment Using Q^2 Predict

Construct	Q^2predict	Interpretation
Future Industry Demand	0.728	Predictive relevance achieved
OVERALL RATING	0.051	Predictive relevance achieved
Perceived Usefulness of MS Project	0.804	Predictive relevance achieved

Table 10 presents the model's predictive relevance using the Q^2predict values for the endogenous constructs. The results indicate that all three constructs achieved predictive relevance because their Q^2predict values were above zero. The strongest predictive relevance was recorded for Perceived Usefulness of MS Project ($Q^2 = 0.804$), suggesting that the model has strong capability to predict how students perceive the usefulness of MS Project based on scheduling awareness, talk effectiveness, and learning challenges. As shown in Table 10, Future Industry Demand also achieved a high Q^2predict value ($Q^2 = 0.728$), indicating that students' perceived usefulness of MS Project provides meaningful predictive power in explaining their views on the future relevance of digital scheduling skills in the construction industry. In contrast, Overall Rating recorded a much lower but

still positive Q^2predict value ($Q^2 = 0.051$), suggesting weak predictive relevance for this construct. This means that while the model can predict students' overall rating to a limited extent, other factors not included in the model—such as speaker delivery, session engagement, webinar organisation, or students' personal interest—may better explain their overall satisfaction. Overall, Table 10 supports the predictive usefulness of the model, particularly in explaining perceived usefulness and future industry demand, which are the central outcomes of this study.

DISCUSSION

The findings of this study provide useful empirical evidence that the MS Project webinar was not merely a technical awareness activity, but a meaningful learning intervention that strengthened students' understanding of digital scheduling and its relevance to future construction practice. In relation to the first objective, which was to examine students' awareness of project scheduling and digital monitoring using MS Project, the descriptive results showed consistently high mean scores across all constructs, particularly for Project Scheduling Awareness, Perceived Usefulness, Future Industry Demand, Talk Effectiveness, and Overall Rating. This suggests that the respondents generally perceived the webinar positively and recognised the value of MS Project in supporting scheduling-related learning. This finding is aligned with recent construction education literature, which argues that digital tools are becoming increasingly important in preparing construction students for project planning, coordination, monitoring, and technology-supported decision-making. Siddiqui et al. (2023), for example, emphasise that future construction professionals require a broader taxonomy of digital skills, including planning, estimation, modelling, digital literacy, and data-driven coordination. In this study, the high score for scheduling awareness indicates that the webinar helped students connect project scheduling concepts with real construction management practices, which is important because digital competence is now closely linked to graduate readiness and employability(Siddiqui et al., 2023).

The assessment model also demonstrated strong measurement quality. All outer loadings exceeded the recommended threshold, confirming that the items used to measure Project Scheduling Awareness, Perceived Usefulness of MS Project, Learning/Implementation Challenges, Future Industry Demand, Talk Effectiveness, and Overall Rating were statistically acceptable and conceptually meaningful. The reliability and convergent validity results were also strong, as all constructs achieved acceptable Cronbach's alpha, composite reliability, and AVE values. These results indicate that the constructs were measured consistently and that the items within each construct captured the intended meaning well. However, the HTMT results require a more careful interpretation. Although most construct relationships achieved acceptable discriminant validity, several HTMT values involving Project Scheduling Awareness, Perceived Usefulness, and Future Industry Demand were relatively high, suggesting that students may have viewed these constructs as closely connected rather than fully separate. This is theoretically understandable because students who are aware of scheduling practices are likely to perceive MS Project as useful, and those who perceive the software as useful are also likely to associate it with future industry demand. In other words, the overlap does not necessarily weaken the model; instead, it reflects the natural closeness between awareness, usefulness, and professional relevance in a webinar-based learning context. Nevertheless, from a Q1-style methodological perspective, this issue should be acknowledged transparently because discriminant validity is essential in PLS-SEM reporting. Recent PLS-SEM literature also stresses the importance of rigorous measurement-model assessment before interpreting structural paths, especially in educational technology studies where perception-based constructs can be conceptually close(Demir & Usak, 2025).

The hypothesis testing results provide clearer insight into the second objective, which was to analyse the influence of project scheduling awareness, learning challenges, and talk effectiveness on students' perceived usefulness of MS Project. The strongest antecedent of perceived usefulness was Project Scheduling Awareness, which had a significant positive effect on Perceived Usefulness of MS Project. This indicates that students who better understood scheduling concepts were more likely to recognise the usefulness of MS Project. This finding is important because it suggests that software training becomes more meaningful when students already have some conceptual understanding of scheduling logic, such as task sequencing, dependencies, milestones, progress monitoring, and resource allocation. The result supports technology acceptance studies showing that perceived usefulness remains one of the most important determinants of learners' acceptance of digital learning

technologies. Jiang et al. (2025), for instance, identify perceived usefulness, perceived ease of use, and digital infrastructure quality as key factors influencing online education adoption(Jiang et al., 2025). Similarly, Wu et al. (2023) found that perceived usefulness and perceived ease of use were positively associated with online learning effectiveness, reinforcing the idea that students are more likely to value a digital tool when they believe it improves learning performance(Wu et al., 2023). In this study, the significant relationship between scheduling awareness and perceived usefulness suggests that students did not evaluate MS Project as an isolated software package, but as a tool that helped them understand and visualise construction scheduling more practically.

Talk Effectiveness also had a significant positive effect on Perceived Usefulness of MS Project, although its effect was weaker than Project Scheduling Awareness. This shows that the quality of the webinar delivery still mattered. A clear, relevant, and industry-oriented talk can help students see how MS Project is used in real project environments, especially when the speaker connects software functions to construction planning and monitoring tasks. This supports the idea that webinar-based learning can be useful when it moves beyond passive presentation and provides professional context, practical examples, and applied relevance. However, the result also suggests that talk delivery alone is not enough. Students' prior or developing awareness of scheduling concepts appears to be more influential in shaping perceived usefulness than the talk experience itself. This has an important pedagogical implication: future MS Project webinars should ideally be integrated with pre-webinar preparation or post-webinar hands-on exercises so that students can actively apply the concepts introduced during the session. This interpretation is consistent with recent technology acceptance research, which shows that learners' digital acceptance is shaped by a combination of instructional design, self-efficacy, prior experience, and perceived learning value(Sasongko et al., 2025)(Alshammari & Alkhwaldi, 2025).

In contrast, Learning/Implementation Challenges did not significantly influence Perceived Usefulness of MS Project. This is an interesting finding because it suggests that although students recognised challenges in learning or applying MS Project, those challenges did not reduce their perception of the software's usefulness. In practical terms, students may have understood that MS Project requires time, practice, and technical familiarity, but they still viewed it as valuable for construction scheduling and future professional work. This result is encouraging because it indicates that perceived difficulty does not necessarily weaken students' recognition of digital tool relevance. However, it also highlights an important instructional issue: students may need more structured support, guided practice, and task-based exercises to move from awareness to competence. In the broader construction context, this is consistent with studies showing that digital transformation requires not only exposure to tools but also sustained training, confidence-building, and applied learning opportunities. Siddiqui et al. (2023) similarly note that construction digital skills require systematic development rather than one-off awareness(Siddiqui et al., 2023). Therefore, the non-significant effect of learning challenges should not be read as evidence that challenges are unimportant. Rather, it suggests that students can still value MS Project even when they are aware that learning the software may be demanding.

The third objective was to determine whether Perceived Usefulness of MS Project predicts students' Future Industry Demand and Overall Rating. The results strongly supported the relationship between Perceived Usefulness and Future Industry Demand. This was the strongest relationship in the model, indicating that students who perceived MS Project as useful were highly likely to view digital scheduling skills as important for future construction industry practice. This finding is central to the contribution of the study. It shows that perceived usefulness acts as a bridge between webinar-based learning and students' professional readiness. The result also reflects the current direction of the construction industry, where digital project control, scheduling, productivity improvement, and technology-supported coordination are becoming increasingly important. Recent industry discussions highlight that construction productivity remains a major concern and that digital workflows and stronger project-control systems are increasingly necessary for improving project delivery(Siddiqui et al., 2023)(Obi et al., 2025). Therefore, the strong link between perceived usefulness and future industry demand suggests that the webinar helped students recognise MS Project not only as an academic tool, but also as a professional skill relevant to employability and construction management practice.

However, Perceived Usefulness did not significantly predict Overall Rating. This suggests that students' overall evaluation of the webinar may have been shaped by other factors beyond the usefulness of MS Project, such as speaker engagement, clarity of explanation, interaction, event organisation, timing, delivery style, or personal interest in the topic. This is a valuable finding because it shows that overall satisfaction and perceived usefulness

are not always the same. Students may agree that MS Project is useful for future construction practice, but their general rating of the webinar may depend on the overall learning experience. From a Q1-style discussion perspective, this distinction is important because it prevents the study from overclaiming the role of perceived usefulness. It also suggests that future evaluations should include additional constructs such as learner engagement, perceived ease of use, speaker quality, interactivity, and hands-on learning support. Recent educational technology studies increasingly argue that acceptance of digital learning tools is shaped not only by usefulness, but also by self-efficacy, ease of use, enjoyment, support, and learning environment quality(Sasongko et al., 2025)(Ortiz-López et al., 2024).

The R^2 and f^2 results further strengthen the interpretation of the model. The model explained a substantial proportion of variance in Perceived Usefulness and Future Industry Demand, indicating strong explanatory power for the core constructs of the study. The large effect of Perceived Usefulness on Future Industry Demand confirms that usefulness is the central mechanism through which webinar-based exposure translates into students' recognition of professional relevance. Similarly, the large effect of Project Scheduling Awareness on Perceived Usefulness shows that conceptual awareness remains foundational to software appreciation. However, the weak explanatory power for Overall Rating indicates that satisfaction-related outcomes require a broader model. This pattern is methodologically meaningful because it shows that the model is more effective in explaining professional readiness than general satisfaction. In other words, the webinar's strongest contribution lies not in producing a high rating alone, but in helping students understand why digital scheduling tools matter for future construction work.

Overall, the findings suggest that the MS Project webinar successfully supported the study objectives by strengthening students' scheduling awareness, reinforcing the perceived usefulness of MS Project, and linking digital scheduling competence to future industry demand. The study contributes to construction management education by showing that webinar-based technical exposure can become a useful bridge between classroom concepts and industry expectations when students perceive the content as relevant, practical, and professionally meaningful. At the same time, the results point to an important limitation of one-off webinar learning: while students may value MS Project and recognise its future relevance, deeper competence will require more hands-on practice, project-based exercises, and integration into formal course assessment. Therefore, future IDP-related learning activities should combine expert talks with applied MS Project tasks, guided scheduling workshops, and real or simulated construction project scenarios. Such an approach would allow students not only to understand the value of digital scheduling, but also to develop the confidence and competence needed to use it in future professional practice.

CONCLUSION

This study concludes that the MS Project webinar provided a meaningful contribution to construction students' digital scheduling readiness, particularly by strengthening their awareness of project scheduling and reinforcing the perceived usefulness of MS Project as an industry-relevant tool. The findings show that students generally responded positively to the webinar, with high mean scores across project scheduling awareness, perceived usefulness, future industry demand, talk effectiveness, and overall rating. More importantly, the structural model revealed that Project Scheduling Awareness and Talk Effectiveness significantly influenced Perceived Usefulness of MS Project, while Perceived Usefulness strongly predicted Future Industry Demand. This suggests that students are more likely to recognise the future value of digital scheduling tools when they understand scheduling concepts and experience a well-delivered, practice-oriented webinar. However, the non-significant effects of Learning/Implementation Challenges on perceived usefulness and Perceived Usefulness on overall rating indicate that technical value alone does not fully explain students' learning experience. Students may still require more hands-on practice, guided software tasks, and project-based exercises to move from awareness to actual competence. Therefore, while the webinar was effective as an introductory industry-based learning intervention, its long-term educational value would be stronger if supported by structured MS Project workshops, real construction scheduling tasks, and integration into IDP assessment. Overall, the study highlights that digital construction readiness cannot be developed through exposure alone; it requires a stronger connection between conceptual understanding, practical software application, and future professional expectations.

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