



Competence and affective commitment as mediators of the effect of job characteristics on the performance of Iranian supervising engineers— supervising engineers' perspective

A. Katebi^{1,*}, Z. Alsadat Ardestani², A. Bordbar¹

¹Department of Civil Engineering, Kharazmi University, Tehran, Iran.

²Department of Urban Planning and Design, Kharazmi University, Tehran, Iran

ABSTRACT: The job performance of Supervising Engineers has a key role in project monitoring and controlling. The growing complexity and accelerated nature of construction projects, driven by the adoption of new technologies, have amplified the significance of job performance among supervising engineers. Therefore, this study aimed to develop a model based on job characteristics, competence, and affective commitment, to quantitatively investigate the influencing factors on supervising engineers' performance in building projects. The proposed model was analyzed with the Partial Least-Squares Structural Equation Modeling (PLS-SEM) method. Questionnaires were distributed among civil engineers who are members of the Iran Construction Engineering Organization (IRCEO). The majority of respondents were male and had more than 5 years of work experience. The primary contribution of this study to the existing body of knowledge lies in the comparison of the impact of affective commitment and competence on the performance of supervising engineers. Additionally, this study has identified the moderator variables within this model. While the results indicated that competence had a greater influence on the performance of supervising engineers compared to other factors ($\beta=0.259$, $p\leq 0.05$), it is noteworthy that the impact of affective commitment ($\beta=0.258$, $p\leq 0.01$) was nearly equivalent. In addition, the moderating effects of work experience, age, marital status, and family support were investigated.

Review History:

Received: Jan. 03, 2023

Revised: Jun. 14, 2023

Accepted: Jul. 04, 2023

Available Online: Sep. 03, 2023

Keywords:

Job performance

competence

affective commitment

job characteristics

building projects

supervising engineers

construction management.

1- Introduction

Supervising engineering constitutes the main component of the monitoring and controlling system in building projects that play a key role in implementing the principles of sustainable development in the construction process [1–3]. According to the International Federation of Consulting Engineers (FIDIC), the poor quality of construction projects in developing countries could be mostly due to the lack of proper project supervision [4]. According to Shahraki et al. (2018), supervising engineers are responsible for 62% of the failures in the Iranian construction industry [1]. Well-supervised projects are approximately twice as satisfactory as other projects [1,5]. Therefore, supervising engineers must have the required competencies for solving professional problems [6,7]. Since these engineers are held responsible for monitoring quality based on well-defined requirements, regulations, and standards, any shortcomings in quality could be associated with their poor performance [1,8]. Unfortunately, the poor performance of supervising engineers has left many building projects without the desired quality and efficiency [1]. Therefore, research on improving the job performance of supervising engineers is of great importance.

According to Hardison et al. (2014), although supervising

engineers are expected to ensure the safety of building projects, their required competencies are still unclear [9]. The factors affecting the performance of supervising engineers include managerial skills, public relations, social behaviors, motivation skills, and control skills [10]. Michael et al. (2006) stated that supervising engineers play a pivotal role in creating positive relationships between employees and can effectively improve job performance, job satisfaction, and safety performance [11].

Hackman and Oldham (1975) proposed the theory of job characteristics, which include skill variety, autonomy, task significance, task identity, and feedback [12]. Djastuti (2015) explored the effects of different job characteristics on the performance of the managers operating in the construction industry of Central Java and reported the considerable impact of job characteristics on managerial performance [13]. Hsu and Liao (2016) examined the impacts of job characteristics on job satisfaction and organizational commitment of foreign workers in Taiwan's construction industry [14]. Moreover, Mostert et al. (2011) investigated the relationship between job characteristics and health conditions in South African construction workers [15].

To understand and evaluate the performance of supervisors, Said and Munap (2010) explored the effects of job characteristics on the job satisfaction of employees

*Corresponding author's email: katebi@khu.ac.ir



in private companies in Malaysia [16]. Johari et al. (2019) addressed the effects of job characteristics on the job performance of Malaysian employees in the public sector and reported that only feedback had a significant effect on their job performance [17]. Onukwube and Iyagba (2011) studied the impacts of job characteristics on the job performance of architects, surveyors, structural engineers, project managers, and electrical and mechanical engineers in Nigeria and represented a significant effect of job characteristics on job performance [18].

Little attention has been given to the utilization of a quantitative approach for analyzing the various factors that influence the job performance of supervising engineers. To the best of the authors' knowledge, no study was found that examines the factors influencing the performance of supervising engineers in construction projects with a quantitative approach. Furthermore, the integrated use of job characteristics, competence, and affective commitment in quantitative studies has received less attention in the construction industry. Supervising engineers are expected to possess a high level of competence to ensure their job performance remains strong and free from unintentional errors. Additionally, they are required to exhibit a high level of commitment to fulfill their responsibilities diligently. Thus, to obtain a comprehensive understanding from both an empowerment and ethical standpoint, this study examined the mediating effects of competence and affective commitment on the relationships between job characteristics and job performance. This study has attempted to develop a model that would not only assist building project stakeholders but also researchers in determining the factors that influence the job performance of supervising engineers in building projects. Furthermore, the present study utilizes Partial Least Squares Structural Equation Modeling (PLS-SEM) and examines the relationships between the variables in more depth by utilizing mediation analysis. Identifying the most important factors influencing the job performance of supervising engineers in building projects, the findings of this study guide economic and educational policymakers to develop and implement appropriate policies and actions to promote monitoring and controlling in building projects. Improving the performance of supervising engineers not only contributes to sustainable construction by following the rules during construction but also leads to the production of buildings in accordance with the principles of sustainable development by properly implementing the relevant plans and regulations.

The purpose of this study is to develop a model based on the job characteristics, competence, and affective commitment to investigate the significance and intensity of the factors affecting the job performance of supervising engineers in building projects. This study investigates the effect of job characteristics on the job performance of supervising engineers both directly and indirectly through the mediation effect of competence and affective commitment.

2- Review of the literature

The contentious nature of the importance and priority assigned to commitment and competence in enhancing supervisors' performance has persisted over time. Supervising engineers bear a significant responsibility for a majority of the failures in the Iranian construction industry [1]. As the literature review progresses, the significance and historical background of each variable and assumption are discussed in further detail.

Extensive research has been conducted on the impact of commitment and competence on the performance of various work groups, such as government employees and teachers [19] [20]. Similarly, studies have explored the influence of job characteristics on job performance [21] [22]. Both competence and affective commitment are internal factors that can significantly affect job performance, while job characteristics represent external factors impacting individuals' performance. However, thus far, the authors have not come across a comprehensive model that simultaneously examines job performance by considering both commitment and competence alongside job characteristics. By investigating internal and external factors concurrently, this model offers a more comprehensive and holistic perspective on the factors influencing job performance.

2- 1- Job Performance

Job performance is probably one of the most important topics in organizational-industrial psychology [23–25]. In general, performance refers to the function of individuals' abilities and motivations [26]. According to Folan and Browne (2005), there is still no universal definition for the word "performance" and it could have different meanings [27,28]. Employee's job performance refers to the behaviors that are in line with the goals of the organization and could be influenced by certain employees [29]. Some researchers define the job performance of supervising engineers as monitoring and controlling the progress of projects based on well-defined standards and regulations, completing step-by-step reports, and preventing project delays and delay claims [30,31].

2- 2- Job Characteristics

According to the theory of job characteristics, developed by Hackman and Oldham, the jobs with the five characteristics of skill variety, autonomy, task significance, task identity, and feedback could be motivational and meaningful for employees [12]. In general, these five characteristics encompass various issues such as employees' sense of responsibility, knowledge as well as a sense of value [17]. The main premise of this theory rests upon the objective job characteristics that affect the outcomes involving job satisfaction and job performance [32]. A noteworthy point in this theory is that the impact of each characteristic on employees' behavior and their job performance depends on how employees experience these characteristics [33].

2- 2- 1- Skill Variety

In the theory of job characteristics, skill variety pertains to the extent to which employees use various skills and abilities for performing different job-related activities [34]. The jobs that require a variety of skills can provide employees with the opportunity to gain much more experience. Furthermore, these jobs make employees feel that their job is meaningful [33]. If employees realize that their job poses a challenge or that they need to improve their skills to succeed, they may feel fruitful, which can affect their job performance [17]. Among the studies that have pointed to the effect of skill variety on job performance, Yuxiu et al. (2011) reported the effect of skill variety on nurses' performance as significant [35]. Therefore, the following hypothesis is proposed:

H1) Skill variety affects the job performance of supervising engineers.

2- 2- 2- Autonomy

In the theory of job characteristics, autonomy refers to the degree of independence and permission to plan tasks and perform the required actions in the workplace [34]. In jobs with a higher level of autonomy, employees feel more in control of the outcomes of their work; thus, the greater the degree of autonomy is, the greater the sense of professional responsibility will be [33]. Employees' autonomy is of particular importance even in governmental organizations, where the level of bureaucratic relations is extremely high and employees are satisfied with the authority they have, which could help them to have better job performance [17,36]. Cui and Xiao (2021) reported a significant effect of autonomy on the job performance of Chinese supervising engineers [37]. It is noteworthy that they did not study the simultaneous effect of other job characteristics on job performance. Therefore, the following hypothesis is proposed:

H2) Autonomy affects the job performance of supervising engineers.

2- 2- 3- Task Significance

In the theory of job characteristics, task significance refers to the significant impacts of the job on the lives or jobs of other people inside/outside the organization [34]. Typically, the importance of the task is highlighted when the employee realizes that the results of his/her work could remarkably affect the well-being of others [12,17]. Various studies have pointed to the effect of task importance on job performance [17,36,38,39]. Therefore, the following hypothesis can be proposed:

H3) Task significance affects the job performance of supervising engineers.

2- 2- 4- Task Identity

In the theory of job characteristics, task identity pinpoints the extent to which it is possible to complete a task individually [34]. In other words, task identity refers to the extent to which an employee can complete a task in person and see the results of his/her effort [33]. If an employee individually performs all the activities that he/she is responsible for, he/she will have a

greater sense of responsibility, a sense of control over his/her affairs, and a sense of ownership [17,40]. Different studies have addressed the effect of task identity on job performance [17,41]. Therefore, the following hypothesis is formed:

H4) Task identity affects the job performance of supervising engineers.

2- 2- 5- Feedback

In the theory of job characteristics, feedback specifies the amount of information that the employee receives about the effectiveness of his/her efforts while performing the job duties [34]. A job should provide feedback on the achievements that could be obtained from the work itself [33]. Feedback helps employees to know what expectations are required to ensure the quality of work. Furthermore, it helps them to understand the quality of their performance. Employees who have performed worse than expected will find ways to improve their performance [12,42]. Several studies have evaluated the effect of feedback on job performance [17,38,43,44]. Therefore, the following hypothesis is made:

H5) Feedback affects the job performance of supervising engineers.

2- 3- Competence

Competence is a multifaceted concept that can not be easily defined [45]. Hager and Gonczi (1996) envision competence as a complex structure of characteristics required for performing intelligently in specific situations and with professional judgment [46]. Eraut (1998) argues that competence integrates traits with performance. He defined competence, which means the ability to perform activities and play roles at the expected standard level [47]. From another perspective, competence refers to the necessary skills for accomplishing tasks safely, effectively, and legally. The development of competence seems to be crucial for both individual and professional growth [45].

From a conceptual perspective, competence could be hardly distinguished from performance. Different theoretical frameworks elucidate different components of competence. Some models claim that competence and performance can not be defined and influenced by each other. However, Gonczi et al. (1993) proposed a theory that demonstrates the effectiveness of competence on performance. According to this theory, employees' competence derives from a series of characteristics such as professional knowledge, skills, or behaviors. These characteristics that constitute competence lead to successful performance [48]. Messick (1984) argues that competence represents what an employee knows and can do in ideal circumstances; however, performance represents what an employee does in practice under the existing circumstances [49]. According to Sekaran and Wagner (1980), the five job characteristics could affect competence as well [50]. Therefore, the following hypotheses can be proposed:

H6) Competence affects the job performance of supervising engineers.

H6- 1) Skill variety affects the competence of supervising engineers.

H6- 2) Autonomy affects the competence of supervising engineers.

H6- 3) Task significance affects the competence of supervising engineers.

H6- 4) Task identity affects the competence of supervising engineers.

H6- 5) Feedback affects the competence of supervising engineers.

2- 4- Affective Commitment

Affective commitment induces a feeling in the employee that makes him/her eager to be introduced by his/her job or organization [51,52]. Affective commitment is one of the most important behavioral actions in the workplace that represents the effectiveness and the employee's role in the organization [52] and is determined by the degree of engagement with the organization or job [53,54]. The employees who are supported by their organization strive to pay off their debt through affective commitment [55,56]. Cohesion in professional teams improves the quality of work-related interactions, where affective commitment is one of its outcomes [57,58].

According to previous studies, researchers have investigated the theoretical background of affective commitment [59–63]. From among the components of commitment, affective commitment has probably received the most attention in the literature [53,60,64,65]. This is due to the impact of affective commitment on important organizational outputs such as citizenship behavior, job performance, and productivity [60,65–67]. Items that are commonly associated with affective commitment include self-esteem, social identity, a sense of stability, a sense of security, and a sense of belonging [68–71].

Affective commitment as one of the components of organizational commitment positively affects job satisfaction and job performance [53]. Avolio et al. (2004) believe that organizational commitment leads to a higher level of job performance [63,72]. Previous research on the potential of organizational commitment for predicting job performance yielded different results [56,73–75]. Numerous researchers including Rashid et al. (2003), Chen et al. (2006), Samad and Selangor (2005), and Riketta (2002) demonstrated that committed employees have a higher level of job motivation as well as job performance [64,76–79]. Vandenberghe et al. (2004) concluded that the nurses' affective commitment to their supervisors affects their job performance and reported the path coefficient of 0.25 with a 99% confidence level [56].

Furthermore, Ugboro (2006) claimed that competence and affective commitment are related to each other [80]. The relationship between job characteristics and affective commitment has been investigated as well [73,81,82]. Therefore, based on the above reasoning, the following hypotheses can be proposed:

H7) Affective commitment affects the job performance of supervising engineers.

H7- 1) Skill variety affects the affective commitment of supervising engineers.

H7- 2) Autonomy affects the affective commitment of supervising engineers.

H7- 3) Task significance affects the affective commitment of supervising engineers.

H7- 4) Task identity affects the affective commitment of supervising engineers.

H7- 5) Feedback affects the affective commitment of supervising engineers.

H7- 6) Competence affects the affective commitment of supervising engineers.

Based on the aforementioned points, the proposed model is presented in Fig. 1.

3- Research Methodology

3- 1- Questionnaire development process

A questionnaire with two main sections was employed to collect the data. The first section consists of the items measuring variables and the second section contains the respondents' demographic background. The questionnaire items were extracted from the literature as seen in Table 1. To make items compatible with supervising engineers in building projects, minor changes were made to some items as needed [83,84].

To examine the content validity of the questions, the Content Validity Ratio Index (CVR) and the average Content Validity Index (CVI) were utilized [85]. For this purpose, the initial questionnaire was distributed three times among 10 construction industry experts, and the simplicity, relevance, and clarity of the items were examined [86]. After three stages of discussion with experts to make the necessary minor changes, all CVR and CVI index values for all items were equal to 1, indicating the appropriate content validity of all items [87,88]. The questionnaire was designed using a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree".

3- 2- Data collection

In this study, the data were collected through distributing questionnaires to the supervising engineers over a period of six months. A random sampling method was used to distribute 280 questionnaires among the members of the Iran Construction Engineering Organization (IRCEO). Finally, 173 responses were received (61.78% response rate), of which 3 were not considered due to incompleteness. Therefore, 170 completed questionnaires were used in the analysis. According to Nulty (2008), the minimum acceptable response rate for research using a paper-based questionnaire is 56% [89].

According to Hair et al. (2021), the minimum sample size required for achieving the R^2 values of 0.10, 0.25, 0.5, and 0.75 in the PLS-SEM-based models is based on the maximum number of hypotheses leading to an endogenous variable [90]. As a result, the minimum sample size assuming a 10% error and the minimum $R^2=0.1$ is determined as 112 samples in the present study [90]. Consequently, the total number of data collected exceeds the stated minimum.

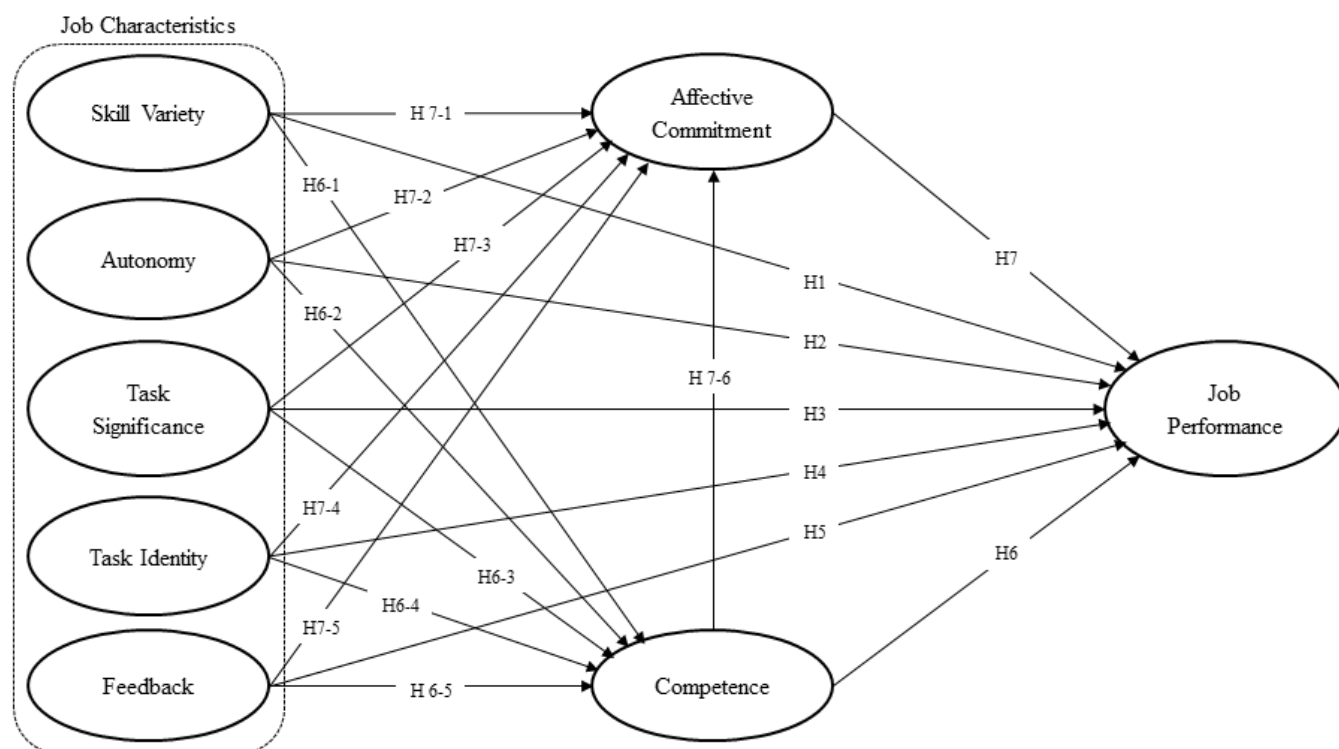


Fig. 1. Proposed research model

3- 3- Data Analysis Method

Data analysis was done in two stages: descriptive statistics of the respondents' demographic characteristics and inferential statistics. According to Hair et al. (2021), the present study employed the PLS-SEM method due to its small sample size and relatively complex model test with mediator and moderator analyses [90]. The analyses based on this method consist of two stages. The first stage refers to the evaluation of the measurement model and the second stage demonstrates the evaluation of the structural model [91]. The results of Cronbach's alpha, composite reliability (CR), rho-A, and communality coefficient tests were studied to assess the reliability of the model [90]. The convergent validity of the measurement model was investigated by the Average Variance Extracted (AVE) test and comparison of the AVE value with the composite reliability. Discriminant validity was measured by the cross-loadings test [90], the Fornell-Larker test, and the Heterotrait-Monotrait Ratio (HTMT). The quality of the measurement model was studied by q^2 index [92,93]. The path coefficient (β), R^2 , and indices were reported in the structural model analyses. The criterion was utilized to define the quality of the structural model. The SRMR and GoF tests were used to evaluate the overall model fit. In the present study, SmartPLS(3.2) was used to analyze the research model [94].

4- Data Analysis and Results

4- 1- Descriptive Statistics

Respondents' demographic data are presented in Table 2. Out of the total respondents, 151 individuals, accounting for 88.82%, were men, while 19 respondents represented 11.18% of the sample and identified as women. Among the participants, 125 individuals (79.41%) were from Tehran province, whereas the remaining respondents were from Alborz province. Almost 36% of them were single and the rest were married. Moreover, 57.65% of the respondents had more than 10 years of work experience.

4- 2- Evaluation of the measurement model

The homogeneity of the reflective variable items is evaluated by the homogeneity test [100]. The items are homogeneous when the factor load is more than 0.7 [90]. A total of two items were removed from the 29 items of the questionnaire, which is equal to 6.9% of the questions and did not exceed the allowable limit (15%) [90].

The Cronbach's alpha values, the composite reliability (CR) values, and the values of the rho-A index for all variables are presented in Table 3, all of which are greater than 0.7. Furthermore, the communality coefficients for all variables are more than 0.5. According to the results of the tests, the reliability of the measurement model is confirmed

Table 1. Questionnaire Items

Variable	Codes	Items	References
Job Performance (JP)	JP1	I always complete the duties specified in my job description.	[95]
	JP2	I meet all the formal performance requirements of my job.	
	JP3	I fulfill all responsibilities required by my job.	
	JP4	I never neglect aspects of my job that I am obligated to perform.	
	JP5	I often fail to perform important duties. *	
Skill Variety (SV)	SV1	My job requires me to do many different things, using a variety of skills and talents.	[96,97]
	SV2	My job requires me to use a number of complex or high-level skills.	
	SV3	My job is simple and repetitive. *	
Autonomy (Aut)	AU1	I decide on my own how to go about doing the work.	[96,97]
	AU2	I cannot use my personal initiative and judgment in carrying out my job. *	
	AU3	I have considerable opportunity for independence and freedom in how I do my job.	
Task Significance (TS)	TS1	The results of my job significantly affect the lives and well-being of other people.	[96,97]
	TS2	A lot of other people can be affected by how well my job gets done.	
	TS3	My job is not significant or important in the broader scheme of things. *	
Task Identity (TI)	TI1	My job is a complete piece of work that has an obvious beginning and end.	[96,97]
	TI2	My job is arranged so that I cannot do an entire piece of work from beginning to end. *	
	TI3	I completely finish the pieces of work I begin.	
Feedback (FB)	FE1	My job provides me clues about how well I am doing.	[96,97]
	FE2	I can figure out how well I am doing, just by doing the work required by my job.	
	FE3	After I finish my job, I don't know whether I performed well. *	
Competence (Com)	CO1	I am confident about my ability to do my job.	[98]
	CO2	I am self-assured about my capabilities to perform my work activities.	
	CO3	I have mastered the skills necessary for my job.	
Affective Commitment (AC)	AC1	Supervising engineering is important to my self-image.	[99]
	AC2	I regret having entered the supervising engineering profession. *	
	AC3	I am proud to be in the supervising engineering profession.	
	AC4	I dislike being a supervising engineer. *	
	AC5	I do not identify with the supervising engineering profession. *	
	AC6	I am enthusiastic about supervising engineering.	

Note: * = Reverse Items.

Table 2. Respondents' Demographic Characteristics

Respondents' Characteristics	Frequency	Frequency Percentage	Cumulative Frequency Percentage
Gender			
Male	151	88.82	88.82
Female	19	11.18	100
Marital Status			
Single (Not Married)	61	35.88	35.88
Married	109	64.12	100
Age (Years)			
Under 25	1	0.59	0.59
25 to 35	65	38.23	38.82
35 to 45	80	47.06	85.88
45 to 55	20	11.76	97.64
Over 55	4	2.35	100
Work Experience (Years)			
Under 5	22	12.94	12.94
5 to 10	50	29.41	42.35
10 to 15	58	34.12	76.47
15 to 20	21	12.35	88.82
Over 20	19	11.18	100

Table 3. Measurement model's validity, reliability, and quality

Variable	Cronbach's		CR	AVE	HTMT							CV-Com		
	Alpha	Rho-A			AC	Aut	Com	FB	JP	TI	TS	SV	q^2	
AC	0.965	0.972	0.972	0.851										0.735
Aut	0.940	0.981	0.961	0.891	0.170									0.665
Com	0.876	0.877	0.924	0.803	0.263	0.182								0.535
FB	0.908	0.913	0.942	0.844	0.273	0.163	0.207							0.598
JP	0.889	0.889	0.923	0.751	0.391	0.103	0.446	0.203						0.543
TI	0.791	0.867	0.903	0.823	0.143	0.340	0.300	0.266	0.352					0.386
TS	0.757	0.760	0.862	0.678	0.314	0.161	0.213	0.333	0.379	0.361				0.351
SV	0.872	1.259	0.913	0.779	0.049	0.189	0.212	0.094	0.161	0.052	0.295			0.505

[90,100–103]. The values of the AVE index of each variable are greater than 0.5. At the same time, they are less than the values of the CR index of the same variables. This represents the convergent validity of the model [90,100,104].

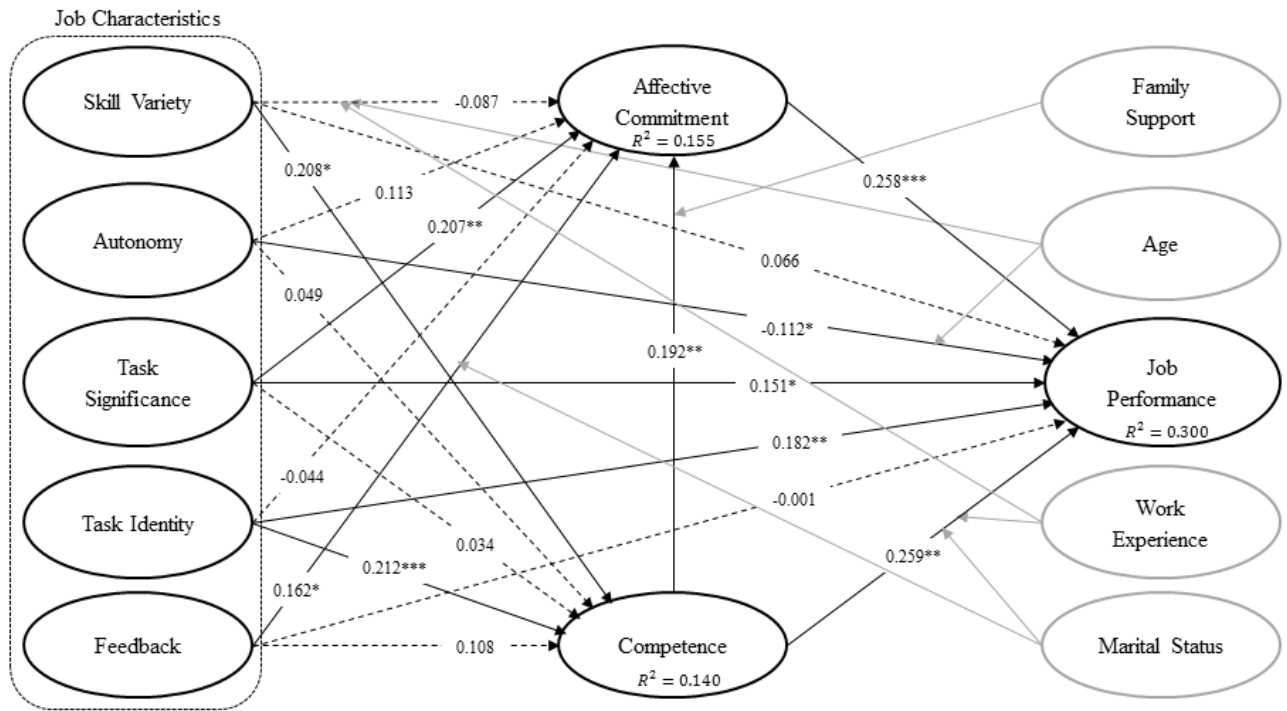
The factor loadings for all the items were at least 0.1 greater than the correlation with other variables which confirms the discriminant validity by the cross-loading test [90,102]. Moreover, the main diagonal values of The Fornell-Larker test matrix of each variable were greater than its correlation with other variables [105,106]. The cross-loadings and the Fornell-Larcker tests do not perform well in detecting discriminant validity under some circumstances [107]. However, these two indicators confirmed the discriminant validity of the research model. Furthermore, The HTMT values for all variables (Table 3) are less than 0.9 [108]. Therefore, the discriminant validity is confirmed. The Construct Cross-validated Communalities (CV-Com) is measured by the q^2 index, which is more than 0.02 for all variables (Table 3). This indicates that the test confirms the quality of the measurement model [92,93,101,109].

4- 3- The evaluation of the Structural Model

Competence had the highest impact on job performance (H6). The aforementioned relationship was confirmed to have a positive effect at a 95% confidence level ($\beta=0.259$, $P<0.05$). Following competence, affective commitment had the most significant impact on job performance (H7). This relationship was confirmed to have a positive effect at a 99% confidence level ($\beta=0.258$, $P<0.01$). Furthermore, the effect of competence on affective commitment (H7-6) was confirmed at a 95% confidence level ($\beta=0.192$, $P<0.05$).

The effect of skill variety on competence (H6-1) was confirmed at a 90% confidence level ($\beta=0.208$, $P<0.1$). The effect of task identity on job performance (H4) ($\beta=0.182$, $P<0.05$) at a 95% confidence level and its effect on competence (H6-4) ($\beta=0.212$, $P<0.01$) at a 99% confidence level were significant. The effect of autonomy on job performance (H2) ($\beta=0.112$, $P<0.1$) was significant at a 90% confidence level.

The effect of task significance on job performance (H3) ($\beta=0.151$, $P<0.1$) at a 90% confidence level and its effect on affective commitment (H7-3) ($\beta=0.207$, $P<0.05$) at a 95%



Note: *, **, and *** = significance level of $p < 0.1$, $p < 0.05$, $p < 0.01$, respectively.

Fig. 2. Analysis results for the research model

confidence level were significant. The effect of feedback on affective commitment (H7-5) was significant at a 90% confidence level ($\beta=0.162$, $P<0.1$).

The values for all endogenous variables of the model are presented in Fig. 2. The index for job performance is 0.300, which demonstrates a strong prediction power according to Cohen's criterion and a moderate prediction power according to Chin's criterion. In addition, the indices for the endogenous variables of competence and affective commitment are equal to 0.140 and 0.155, respectively, which according to Cohen's criterion, have moderate predictive power [90,110,111]. The f^2 index indicates the substantive effect of a variable removed from the model [104,107]. To evaluate this index, Cohen (1988) stated the values of 0.02, 0.15, and 0.35 as small, medium, and large, respectively [110]. Affective commitment had the largest effect size on job performance (small to medium effect, $f^2=0.080$). The effect size of competence on job performance (small to medium effect, $f^2=0.079$) was smaller than affective commitment, however they were close.

The Cross-validated Redundancy index (CV-Red) test is performed to evaluate the quality of the structural model [92,93]. To that end, all constructs had positive Q^2 values (Affective Commitment=0.119; Competence=0.092; Job Performance=0.196); therefore, the predictive relevance of the structural model is acceptable [100,104,109]. The SRMR index in the present study is 0.058, which is smaller than 0.08. Therefore, the overall fit of the model is confirmed by this index [112,113]. Moreover, the GoF index is equal to 0.399. Accordingly, the overall model fit is strong in this study [114].

4- 4- Mediation analysis

To investigate the mediation effect of competence and affective commitment on the relationships between job characteristics and job performance, Baron and Kenny's (1986) method was employed [115,116]. The results of mediation hypotheses were assessed based on Variance Accounted For (VAF) ratio [90,117]. The mediating effect of affective commitment on the relationship between task significance and job performance has been confirmed (VAF=0.261). Additionally, the mediating effect of competence on the relationship between task identity and job performance (VAF=0.232) as well as the relationship between skill variety and job performance has been confirmed (VAF=0.449). In the above-mentioned hypotheses, the VAF index falls within the range of 0.2 and 0.8. Accordingly, they have a partial mediating effect [90].

4- 5- Moderator analysis

Using the Product Indicator method [111,118], the researchers investigated the moderating effect of various demographic variables on all hypotheses and the relationships in the model. According to Ifinedo (2016), demographic variables could facilitate our understanding of the issue [119]. The moderator analyses that led to the identification and confirmation of a moderator effect are listed in Table 4. The moderating effect of age on the relationship between autonomy and job performance as well as the relationship between skill variety and affective commitment has been confirmed. Moreover, the moderating effect of work experience on the relationship between competence and job

Table 4. Moderation effect Hypotheses

Moderator	Path	β	p-value	T-value	Validation
Age	Autonomy \rightarrow Job Performance	0.155*	0.089	1.703	Supported
Age	Skill Variety \rightarrow Affective Commitment	0.185*	0.076	1.780	Supported
Work Experience	Skill Variety \rightarrow Affective Commitment	0.180**	0.038	2.085	Supported
Work Experience	Competence \rightarrow Job Performance	-0.180*	0.075	1.782	Supported
Family Support	Competence \rightarrow Affective Commitment	-0.167*	0.091	1.696	Supported
Marital Status	Feedback \rightarrow Affective Commitment	-0.227***	0.009	2.639	Supported
Marital status	Competence \rightarrow Job Performance	-0.210**	0.013	2.495	Supported

Note: *, **, and *** = significance level of $p < 0.1$, $p < 0.05$, $p < 0.01$, respectively.

performance as well as the relationship between skill variety and affective commitment has been confirmed. Likewise, family support demonstrated a moderating effect on the impact of competence on affective commitment. Additionally, the moderating effect of marital status on the relationship between feedback and affective commitment as well as the relationship between competence and job performance has been confirmed.

5- Discussion

This research measures the factors influencing the job performance of supervising engineers in building projects by integrating job characteristics, competence, and affective commitment that have a more rigorous justification in the job performance literature. The aim of developing this model was to incorporate empowerment and ethical perspective to improve monitoring and controlling.

According to the research model, competence had the most considerable significant positive effect on the job performance of supervising engineers. The finding illustrated that the more capable the supervising engineers are, the more job performance they exhibit. This is consistent with the key findings from previous studies which stated competence is an important driver of job performance [47–49]. For instance, in the field of educational services, Eraut (1998) and Messick (1984) have stated that competence determines performance. They argue that performance is derived from the knowledge and the skills of a person which are referred to as competencies [47,49]. Although moderation analysis illustrated that (Fig. 3), improving the competence of supervising engineers has increased the performance of less experienced and single engineers, it has not revealed a serious positive effect of competence on the performance of more experienced and married engineers. In other words, single and less experienced supervising engineers are more willing to apply their competencies to improve their job performance as their competencies develop. On the other hand, married and more experienced supervising engineers are accustomed to their work routines and are less likely to use their new competencies to make changes.

Based on the results, there is a positive and statistically significant relationship between affective commitment and the job performance of supervising engineers. This result is consistent with the findings of many studies that have suggested that affective commitment is a factor in improving job performance [53,60,63–67,72,76]. For instance, Ribeiro et al. (2020) studied 26 private, small, and medium-sized enterprises in Portugal and stated that affective commitment has the most positive impact on job performance among the organizational commitment dimensions. They argue that affective commitment, as a work attitude, leads to higher levels of job performance [63]. As a result, increasing the positive ethical and emotional perspectives of supervising engineers towards their profession could motivate them to exhibit better performance.

The findings revealed that task identity, task significance, and autonomy as job characteristics have significant effects on job performance. Consistent with this result, Onukwube and Iyagba (2011) reported a significant relationship between job characteristics and the performance of architects, surveyors, structural engineers, construction project managers, and service engineers in Nigeria [18]. Despite the alignment of their conclusions with some of the findings of this study, it is observed that feedback and skill variety did not have a direct effect on the job performance of supervising engineers in building projects. According to the results of the moderation analysis, the impact of increasing autonomy on the performance of supervising engineers differs based on their age. For young engineers, increasing autonomy has been found to weaken performance, whereas, for older engineers, it has shown a slight improvement in performance.

Mediation analysis illustrated the partial mediation effect of competence on the impacts of task identity and skill variety on job performance. This means that the impacts of task identity and skill variety on the job performance of supervising engineers are partially conveyed through the improvement of their competence. Moreover, the results represented that the task significance not only directly but also indirectly affects the performance of supervising engineers through the mediating effect of affective commitment. A

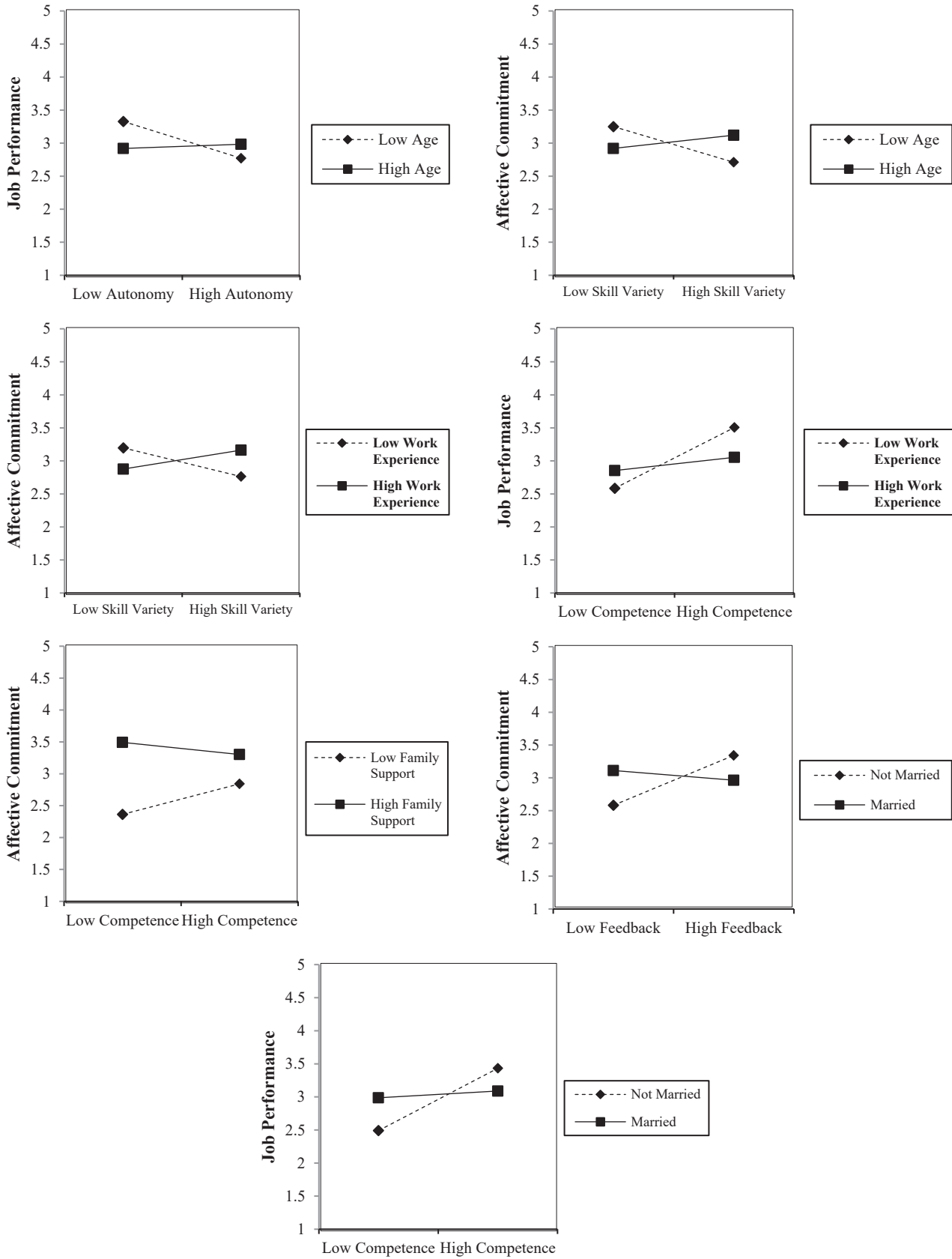


Fig. 3. Influence of demographics on key variables

more comprehensive understanding of the responsibilities of the profession and its impact on society may lead supervisors to demonstrate deeper affective commitment and higher performance.

According to the obtained results and based on Fig. 3 [120], performing tasks that require more skill variety, while increasing the affective commitment of older and more experienced supervising engineers, has had a negative effect on the affective commitment of young and less experienced engineers. This may suggest that less experienced and younger supervising engineers, with increasing diversity in work activities, suffer from fatigue and boredom, and compared to the more experienced and older supervising engineers, they are more likely to leave their jobs and their organizations.

Based on the results, on the one hand, increasing the competence of supervising engineers has weakened the affective commitment of engineers who have received more support from their families, but on the other hand, it has improved the affective commitment of engineers who have received less family support.

Despite the positive effect of feedback on the affective commitment of single supervising engineers, the feedback revealed a negative impact on the affective commitment of married engineers (Fig 3). This issue may indicate that creating a sense of affective commitment in single supervising engineers compared to married ones is more influenced by the feedback received from work. As demonstrated in Fig. 3, it seems that the process of changing the affective commitment of supervising engineers can be significantly affected by their family issues.

6- Limitations

The research presents several innovations, but it is important to acknowledge the following limitations:

The job performance evaluation of supervising engineers in this study was conducted using reliable self-assessment questionnaires. However, due to access restrictions, particularly during the COVID-19 pandemic, alternative evaluation techniques such as 360-degree evaluation were not feasible.

The respondents of the questionnaires primarily resided in the cities of Tehran and Karaj, which may limit the generalizability of the findings to a broader population. Additionally, given that the supervisory engineer role is predominantly occupied by men, the number of female respondents in this study was relatively small, potentially affecting the gender representation and generalizability of the results.

This research primarily examined commitment from the perspective of affective commitment, while other dimensions of commitment were not explicitly considered.

7- Conclusion

In recent years, the performance of supervising engineers has gained increasing importance due to its impact on project monitoring and control, adherence to construction laws, and the principles of sustainable development in the construction

industry. This study aimed to assess the significance and severity of factors affecting the performance of supervising engineers in building projects using the PLS-SEM technique. The study examined the direct effects of job characteristics, competence, and affective commitment on job performance, as well as the mediating effects of competence and affective commitment.

The primary contribution of this article to the existing body of knowledge can be summarized as follows:

Competence had the most significant impact on the job performance of supervising engineers compared to other variables.

Affective commitment, autonomy, task significance, and task identity had statistically significant direct effects on job performance.

the predictor variables explained 30% of the variance in job performance, indicating a moderate level of explanation.

Skill variety and task identity indirectly influenced the job performance of supervising engineers through the mediating role of competence.

Task significance indirectly affected performance through the mediating role of affective commitment.

The study identified family support as a moderator in the relationship between competence and affective commitment.

The moderating effects of work experience and marital status on the relationship between competence and job performance were confirmed.

The age of supervising engineers also played a significant moderating role in the relationship between autonomy and job performance.

Marital status was found to moderate the relationship between feedback and affective commitment.

Younger supervising engineers experienced a decrease in job performance and affective commitment with increased authority and skill variety, whereas unmarried engineers showed improved performance and affective commitment with increased feedback and competence, respectively.

The developed model of this study was confirmed through multiple statistical tests, making it a valuable foundation for researchers conducting quantitative analyses of job performance in other working groups. The findings can guide policymakers in adopting effective approaches to enhance the performance of supervising engineers, particularly in building projects. However, further research is needed to reach a definitive conclusion on the minor effects of autonomy, task identity, and task significance on the job performance of supervising engineers. Additionally, researchers can consider adding and supplementing other variables not included in the proposed model to gain a more comprehensive understanding of the factors influencing the performance of supervising engineers in building projects.

8- Practical and theoretical implications

Supervising engineers, as integral components of the monitoring and controlling system in building projects, hold a pivotal role across various project management knowledge areas. Hence, the pursuit of novel methods to enhance their

performance can significantly bolster project effectiveness. 1,121]]. This study offers valuable insights into the factors influencing the job performance of supervising engineers in building projects, encompassing both ethical considerations and empowerment perspectives. By delving deeper into these aspects, a comprehensive understanding of the dynamics impacting job performance can be achieved.

The present study has made a significant theoretical advancement by quantitatively investigating the job performance of supervising engineers through the integration of job characteristics theory with competence and affective commitment variables. The authors have successfully developed a theoretical model and employed a quantitative approach utilizing PLS-SEM in the context of job performance research. The confirmation of validity and reliability indicators, along with the model fit indices, has provided substantial support for the suitability of the developed model. This model can serve as a valuable foundation for future quantitative research on job performance in other working groups within the construction industry, thus fostering the advancement of research in this field.

Based on the findings of this research, the following suggestions can be made for hiring, ranking, and managing supervising engineers:

Give importance to both affective commitment and competence when assessing and selecting supervising engineers.

Consider limiting the authority of supervising engineers while increasing their task identity and emphasizing the significance of their assigned tasks, as these factors can positively impact their performance.

Allocate tasks to young engineers that involve limited skill variety and restricted authority. Additionally, prioritize assessing and fostering their affective commitment, particularly for less experienced engineers.

Entrust senior supervising engineers with multi-skill tasks and empower them with authority.

Utilize feedback for single engineers and give greater attention to assessing and enhancing the competence of single engineers.

9- Future research directions

In this study, the performance evaluation of supervising engineers was carried out using reliable self-assessment questionnaires. However, the inclusion of alternative performance evaluation methods, such as 360-degree evaluation, is anticipated to potentially enhance the accuracy of the results. The proposed research model is founded on the job characteristics theory, encompassing competence and affective commitment variables. By integrating the developed model with other theories, novel insights and achievements can be attained. Additionally, exploring the application of the proposed model in different working groups presents an intriguing avenue for future research.

Declaration of interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work

reported in this paper. We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Ethical standard: The present study was approved by the ethics committee of Kharazmi University (The ethics code: IR.KHU.REC.1400.023). Respondents were informed that their cooperation in this research was voluntary and if they agreed to cooperate, their responses were used for research purposes and their answers remained confidential.

Acknowledgements: We would like to express our special thanks and gratitude to prof. Gholamreza Asadollahfardi for sharing his pearls of wisdom and experience with us to improve this research. We are immensely grateful to him for his comments on an earlier version of the manuscript. His insightful comments and suggestions have truly shined a light on our path and helped us to achieve better and brighter intuition.

References

- [1] S. Shahraki, E. Saghatforoush, A.Z. Ravasan, Identification and Classification of Factors Affecting the Performance of Building Supervisor Engineers for Construction Industry., *J. Eng. Proj. Prod. Manag.* 8 (2018).
- [2] S. Mjakuškina, M. Kavosa, I. Lapiņa, Achieving Sustainability in the Construction Supervision Process, *J. Open Innov. Technol. Mark. Complex.* 5 (2019) 47.
- [3] A. Salehi, P. Sadat Goosheh, Evaluating the role of supervising engineers and designers in optimizing buildings energy consumptions in line with the implementation of national building regulations, in: 3rd Natl. Conf. Clim. Build. Energy Consum. Optim. with Sustain. Dev. Approach [In Persian], 2015.
- [4] FIDIC | Quality of Construction | International Federation of Consulting Engineers, (n.d.).
- [5] M.J. Spilsbury, J. Brann, S. Norgbey, Quality of project supervision review 2009, in: *Summ. Rep., Evaluation Office, Quality Assurance Section, UNEP*, 2010.
- [6] D. Peterson, *Safety Supervision*, second ed, American Society of Safety Engineers, Des Plaines., 1999.
- [7] G. Odiorne, The new breed of supervisor: leaders in self-managed work teams, *Supervision.* 52 (1991) 14–17.
- [8] F. Liu, Analysis of supervision engineers' quality, *Shanxi Constr.* 30 (2004) 86–87.
- [9] D. Hardison, M. Behm, M.R. Hallowell, H. Fonooni, Identifying construction supervisor competencies for effective site safety, *Saf. Sci.* 65 (2014) 45–53.
- [10] R.S. Maheshkumar, S.K. Purva, Impact of Supervision on Rework in Construction In, *Int. J. Recent Innov. Trends Comput. Commun.* 4 (2016) 1–7.
- [11] J.H. Michael, Z.G. Guo, J.K. Wiedenbeck, C.D. Ray, Production supervisor impacts on subordinates' safety outcomes: An investigation of leader-member exchange and safety communication, *J. Safety Res.* 37 (2006) 469–477.
- [12] J.R. Hackman, G.R. Oldham, Development of the job diagnostic survey., *J. Appl. Psychol.* 60 (1975) 159.

- [13] I. Djastuti, The influence of job characteristics on job satisfaction, organizational commitment and managerial performance a study on construction companies in Central Java, *Int. Res. J. Bus. Stud.* 3 (2015).
- [14] L. Hsu, P. Liao, From job characteristics to job satisfaction of foreign workers in Taiwan's construction industry: The mediating role of organizational commitment, *Hum. Factors Ergon. Manuf. Serv. Ind.* 26 (2016) 243–255.
- [15] K. Mostert, M. Peeters, I. Rost, Work-home interference and the relationship with job characteristics and well-being: a South African study among employees in the construction industry, *Stress Heal.* 27 (2011) e238–e251.
- [16] N.A. Said, R. Munap, Job characteristics and job satisfaction: A relationship study on supervisors performance, in: 2010 IEEE Int. Conf. Manag. Innov. Technol., IEEE, 2010: pp. 714–719.
- [17] J. Johari, F.M. Shamsudin, T.F. Yean, K.K. Yahya, Z. Adnan, Job characteristics, employee well-being, and job performance of public sector employees in Malaysia, *Int. J. Public Sect. Manag.* (2019).
- [18] H.N. Onukwube, R. Iyagba, Construction professionals job performance and characteristics: A comparison of indigenous and expatriate construction companies in Nigeria, *Australas. J. Constr. Econ. Build.* 11 (2011) 71–83.
- [19] J.B. Sørensen, D.J. Phillips, Competence and commitment: employer size and entrepreneurial endurance, *Ind. Corp. Chang.* 20 (2011) 1277–1304. <https://doi.org/10.1093/icc/dtr025>.
- [20] C.-P. Lin, C.-M. Liu, H.-T. Chan, Developing job performance: mediation of occupational commitment and achievement striving with competence enhancement as a moderator, *Pers. Rev.* 51 (2022) 750–769. <https://doi.org/10.1108/PR-04-2020-0296>.
- [21] A. Grobelna, Effects of individual and job characteristics on hotel contact employees' work engagement and their performance outcomes, *Int. J. Contemp. Hosp. Manag.* 31 (2019) 349–369. <https://doi.org/10.1108/IJCHM-08-2017-0501>.
- [22] E. Kahya, The effects of job characteristics and working conditions on job performance, *Int. J. Ind. Ergon.* 37 (2007) 515–523. <https://doi.org/https://doi.org/10.1016/j.ergon.2007.02.006>.
- [23] A. Katebi, M.H. HajiZadeh, A. Bordbar, A.M. Salehi, The Relationship Between “Job Satisfaction” and “Job Performance”: A Meta-analysis, *Glob. J. Flex. Syst. Manag.* (2021). <https://doi.org/10.1007/s40171-021-00280-y>.
- [24] J.E. Bono, T.A. Judge, Core self-evaluations: A review of the trait and its role in job satisfaction and job performance, *Eur. J. Pers.* 17 (2003) S5–S18.
- [25] F.L. Schmidt, J.E. Hunter, Development of a causal model of processes determining job performance, *Curr. Dir. Psychol. Sci.* 1 (1992) 89–92.
- [26] T.A. Judge, A. Erez, J.E. Bono, The power of being positive: The relation between positive self-concept and job performance, *Hum. Perform.* 11 (1998) 167–187.
- [27] P. Folan, J. Browne, A review of performance measurement: Towards performance management, *Comput. Ind.* 56 (2005) 663–680.
- [28] N. Valaei, S. Jiroudi, Job satisfaction and job performance in the media industry: A synergistic application of partial least squares path modelling, *Asia Pacific J. Mark. Logist.* (2016).
- [29] M. Sony, N. Mekoth, The relationship between emotional intelligence, frontline employee adaptability, job satisfaction and job performance, *J. Retail. Consum. Serv.* 30 (2016) 20–32.
- [30] E. Fallah Tafti, H. Mosalman Yazdi, M. Javaheri, Investigating and evaluating the performance of supervising engineers and prioritizing the factors affecting it, in: 3rd Natl. Conf. Constr. Mater. New Technol. Constr. Ind. [In Persian], 2016.
- [31] N.A. Krifa, G. Wood, G.F. Aouad, Z. Hatush, Assessing the performance of Libyan supervising engineers, *Constr. Manag. Econ.* 25 (2007) 509–518.
- [32] R.K. Purvanova, J.E. Bono, J. Dziewieczynski, Transformational leadership, job characteristics, and organizational citizenship performance, *Hum. Perform.* 19 (2006) 1–22.
- [33] J.R. Hackman, E.E. Lawler, Employee reactions to job characteristics., *J. Appl. Psychol.* 55 (1971) 259.
- [34] G.R. Oldham, Job characteristics and internal motivation: The moderating effect of interpersonal and individual variables, *Hum. Relations.* 29 (1976) 559–569.
- [35] P. Yuxiu, W. Kunaviktikul, P. Thungjaroenkul, Job characteristics and job performance among professional nurses in the university hospitals of people's Republic of China, *Chiang Mai Univ. J. Nat. Sci.* 10 (2011) 171–180.
- [36] S. Hassan, Sources of professional employees' job involvement: An empirical assessment in a government agency, *Rev. Public Pers. Adm.* 34 (2014) 356–378.
- [37] N. CUI, S.-F. XIAO, How Much does Job Autonomy Matter for Job Performance of Chinese Supervising Engineers: A Quantitative Study, *East Asian J. Bus. Econ.* 9 (2021) 71–82.
- [38] J. Krasman, Putting feedback-seeking into “context”: job characteristics and feedback-seeking behaviour, *Pers. Rev.* (2013).
- [39] S. Hauff, N. Richter, Power distance and its moderating role in the relationship between situational job characteristics and job satisfaction: An empirical analysis using different cultural measures, *Cross Cult. Manag.* 22 (2015) 68–89.
- [40] M.A. Faturochman, The job characteristics theory: A review, *Bul. Psikol. UGM*, December 2nd 1997. (1997).
- [41] A.A. Uruthirapathy, G.G. Grant, The influence of job characteristics on IT and non-IT job professional's turnover intentions, *J. Manag. Dev.* 34 (2015) 715–728.
- [42] J.R. Hackman, G.R. Oldham, *Work Redesign*, AddisonWesley, Reading, MA. (1980).
- [43] P. Ghosh, A. Rai, R. Chauhan, N. Gupta, A. Singh, Exploring the moderating role of context satisfaction between job characteristics and turnover intention of employees of Indian public sector banks, *J. Manag. Dev.* 34 (2015) 1019–1030.
- [44] E. Bacha, The relationship between transformational

- leadership, task performance and job characteristics, *J. Manag. Dev.* 33 (2014) 410–420.
- [45] A. Alsop, Perspectives on competence, *Br. J. Ther. Rehabil.* 8 (2001) 258–264.
- [46] P. Hager, A. Gonczi, Professions and competencies, *Boundaries Adult Learn.* (1996) 246–260.
- [47] M. Eraut, Concepts of competence, *J. Interprof. Care.* 12 (1998) 127–139. <https://doi.org/10.3109/13561829809014100>.
- [48] A. Gonczi, P. Hager, J. Athanasou, *The development of competency-based assessment strategies for the professions*, AGPS Canberra, 1993.
- [49] S. Messick, *The psychology of educational measurement*, ETS Res. Rep. Ser. 1984 (1984) i–55.
- [50] U. Sekaran, F.R. Wagner, Sense of competence: A cross-cultural analysis for managerial application, *Gr. Organ. Stud.* 5 (1980) 340–352.
- [51] J.P. Meyer, N.J. Allen, A three-component conceptualization of organizational commitment, *Hum. Resour. Manag. Rev.* 1 (1991) 61–89.
- [52] S. Qian, Q. Yuan, W. Niu, Z. Liu, Is job insecurity always bad? The moderating role of job embeddedness in the relationship between job insecurity and job performance, *J. Manag. Organ.* (2019) 1–17.
- [53] N. Ribeiro, D. Gomes, S. Kurian, Authentic leadership and performance: the mediating role of employees' affective commitment, *Soc. Responsib. J.* (2018).
- [54] N.J. Allen, J.P. Meyer, Construct validation in organizational behavior research: The case of organizational commitment, in: *Probl. Solut. Hum. Assess.*, Springer, 2000: pp. 285–314.
- [55] R.P. Settoon, N. Bennett, R.C. Liden, Social exchange in organizations: Perceived organizational support, leader–member exchange, and employee reciprocity., *J. Appl. Psychol.* 81 (1996) 219.
- [56] C. Vandenberghe, K. Bentein, F. Stinglhamber, Affective commitment to the organization, supervisor, and work group: Antecedents and outcomes, *J. Vocat. Behav.* 64 (2004) 47–71.
- [57] R. Hackman, *Group influences on individuals in organizations.*, Consulting Psychologists Press, 1992.
- [58] T.S. Heffner, J.R. Rentsch, Organizational commitment and social interaction: A multiple constituencies approach, *J. Vocat. Behav.* 59 (2001) 471–490.
- [59] N.J. Allen, J.P. Meyer, Affective, continuance, and normative commitment to the organization: An examination of construct validity, *J. Vocat. Behav.* 49 (1996) 252–276.
- [60] J.P. Meyer, D.J. Stanley, L. Herscovitch, L. Topolnytsky, Affective, continuance, and normative commitment to the organization: A meta-analysis of antecedents, correlates, and consequences, *J. Vocat. Behav.* 61 (2002) 20–52.
- [61] A. Rego, A. Vitória, A. Magalhães, N. Ribeiro, M.P. e Cunha, Are authentic leaders associated with more virtuous, committed and potent teams?, *Leadersh. Q.* 24 (2013) 61–79.
- [62] A.S.D. Smedo, A.F.M. Coelho, N.M.P. Ribeiro, Effects of authentic leadership, affective commitment and job resourcefulness on employees' creativity and individual performance, *Leadersh. Organ. Dev. J.* (2016).
- [63] N. Ribeiro, A.P. Duarte, R. Filipe, R. Torres de Oliveira, How authentic leadership promotes individual creativity: The mediating role of affective commitment, *J. Leadersh. Organ. Stud.* 27 (2020) 189–202.
- [64] M. Ricketta, Attitudinal organizational commitment and job performance: a meta-analysis, *J. Organ. Behav. Int. J. Ind. Occup. Organ. Psychol. Behav.* 23 (2002) 257–266.
- [65] C. Vandenberghe, K. Bentein, A. Panaccio, Affective commitment to organizations and supervisors and turnover: A role theory perspective, *J. Manage.* 43 (2017) 2090–2117.
- [66] A. Cooper-Hakim, C. Viswesvaran, The construct of work commitment: testing an integrative framework., *Psychol. Bull.* 131 (2005) 241.
- [67] J.P. Meyer, L. Herscovitch, Commitment in the workplace: Toward a general model, *Hum. Resour. Manag. Rev.* 11 (2001) 299–326.
- [68] S.E. Hobfoll, Social and psychological resources and adaptation, *Rev. Gen. Psychol.* 6 (2002) 307–324.
- [69] É. Lapointe, C. Vandenberghe, A. Panaccio, Organizational commitment, organization-based self-esteem, emotional exhaustion and turnover: A conservation of resources perspective, *Hum. Relations.* 64 (2011) 1609–1631.
- [70] K.-H. Schmidt, Organizational commitment: A further moderator in the relationship between work stress and strain?, *Int. J. Stress Manag.* 14 (2007) 26.
- [71] É. Lapointe, C. Vandenberghe, J.-S. Boudrias, Psychological contract breach, affective commitment to organization and supervisor, and newcomer adjustment: A three-wave moderated mediation model, *J. Vocat. Behav.* 83 (2013) 528–538.
- [72] B.J. Avolio, W.L. Gardner, F.O. Walumbwa, F. Luthans, D.R. May, Unlocking the mask: A look at the process by which authentic leaders impact follower attitudes and behaviors, *Leadersh. Q.* 15 (2004) 801–823.
- [73] J.E. Mathieu, D.M. Zajac, A review and meta-analysis of the antecedents, correlates, and consequences of organizational commitment., *Psychol. Bull.* 108 (1990) 171.
- [74] D.M. Randall, The consequences of organizational commitment: Methodological investigation, *J. Organ. Behav.* 11 (1990) 361–378.
- [75] A. Cohen, Career stage as a moderator of the relationships between organizational commitment and its outcomes: A meta-analysis, *J. Occup. Psychol.* 64 (1991) 253–268.
- [76] J. Chen, C. Silverthorne, J. Hung, Organization communication, job stress, organizational commitment, and job performance of accounting professionals in Taiwan and America, *Leadersh. Organ. Dev. J.* (2006).
- [77] S. Samad, S.A. Selangor, Unraveling the organizational commitment and job performance relationship: Exploring the moderating effect of job satisfaction, *Bus. Rev.* 4 (2005) 79–84.
- [78] N. Ribeiro, İ. Yücel, D. Gomes, How transformational

- leadership predicts employees' affective commitment and performance, *Int. J. Product. Perform. Manag.* (2018).
- [79] Z.A. Rashid, M. Sambasivan, J. Johari, The influence of corporate culture and organisational commitment on performance, *J. Manag. Dev.* (2003).
- [80] I.O. Ugboro, Organizational commitment, job redesign, employee empowerment and intent to quit among survivors of restructuring and downsizing, *J. Behav. Appl. Manag.* 7 (2006) 232–257.
- [81] M.S. Zargar, C. Vandenberghe, C. Marchand, A.K. Ben Ayed, Job scope, affective commitment, and turnover: The moderating role of growth need strength, *J. Occup. Organ. Psychol.* 87 (2014) 280–302.
- [82] S.E. Humphrey, J.D. Nahrgang, F.P. Morgeson, Integrating motivational, social, and contextual work design features: a meta-analytic summary and theoretical extension of the work design literature., *J. Appl. Psychol.* 92 (2007) 1332.
- [83] S. Nikou, Factors driving the adoption of smart home technology: An empirical assessment, *Telemat. Informatics.* 45 (2019) 101283.
- [84] A. Katebi, P. Homami, M. Najmeddin, Acceptance model of precast concrete components in building construction based on Technology Acceptance Model (TAM) and Technology, Organization, and Environment (TOE) framework, *J. Build. Eng.* 45 (2021) 103518. <https://doi.org/https://doi.org/10.1016/j.jobte.2021.103518>.
- [85] E. Almanasreh, R. Moles, T.F. Chen, Evaluation of methods used for estimating content validity, *Res. Soc. Adm. Pharm.* 15 (2019) 214–221.
- [86] P. Ifinedo, An empirical analysis of factors influencing Internet/e-business technologies adoption by SMEs in Canada, *Int. J. Inf. Technol. Decis. Mak.* 10 (2011) 731–766.
- [87] C.H. Lawshe, A quantitative approach to content validity, *Pers. Psychol.* 28 (1975) 563–575.
- [88] D.F. Polit, C.T. Beck, The content validity index: are you sure you know what's being reported? Critique and recommendations, *Res. Nurs. Health.* 29 (2006) 489–497.
- [89] D.D. Nulty, The adequacy of response rates to online and paper surveys: what can be done?, *Assess. Eval. High. Educ.* 33 (2008) 301–314.
- [90] J.F. Hair Jr, G.T.M. Hult, C.M. Ringle, M. Sarstedt, A primer on partial least squares structural equation modeling (PLS-SEM), Sage publications, 2021.
- [91] J. Henseler, W.W. Chin, A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling, *Struct. Equ. Model.* 17 (2010) 82–109.
- [92] S. Geisser, A predictive approach to the random effect model, *Biometrika.* 61 (1974) 101–107.
- [93] M. Stone, Cross-validators choice and assessment of statistical predictions, *J. R. Stat. Soc. Ser. B.* 36 (1974) 111–133.
- [94] C.M. Ringle, S. Wende, J.-M. Becker, SmartPLS 3, Boenningstedt SmartPLS GmbH. (2015).
- [95] F. Manzoor, L. Wei, T. Bányai, M. Nurunnabi, Q.A. Subhan, An examination of sustainable HRM practices on job performance: An application of training as a moderator, *Sustainability.* 11 (2019) 2263.
- [96] J.B. Thatcher, L.P. Stepina, R.J. Boyle, Turnover of information technology workers: Examining empirically the influence of attitudes, job characteristics, and external markets, *J. Manag. Inf. Syst.* 19 (2002) 231–261. <https://doi.org/10.1080/07421222.2002.11045736>.
- [97] M.G. Morris, V. Venkatesh, Job characteristics and job satisfaction: understanding the role of enterprise resource planning system implementation., *Mis Q.* 34 (2010).
- [98] G.M. Spreitzer, Psychological empowerment in the workplace: Dimensions, measurement, and validation, *Acad. Manag. J.* 38 (1995) 1442–1465.
- [99] J.P. Meyer, N.J. Allen, C.A. Smith, Commitment to organizations and occupations: Extension and test of a three-component conceptualization., *J. Appl. Psychol.* 78 (1993) 538.
- [100] J. Henseler, C.M. Ringle, R.R. Sinkovics, The use of partial least squares path modeling in international marketing, in: *New Challenges to Int. Mark.*, Emerald Group Publishing Limited, 2009.
- [101] M. Tenenhaus, V.E. Vinzi, Y.-M. Chatelin, C. Lauro, PLS path modeling, *Comput. Stat. Data Anal.* 48 (2005) 159–205.
- [102] J.F. Hair, C.M. Ringle, M. Sarstedt, PLS-SEM: Indeed a silver bullet, *J. Mark. Theory Pract.* 19 (2011) 139–152.
- [103] C.M. Ringle, M. Sarstedt, R. Schlittgen, Genetic algorithm segmentation in partial least squares structural equation modeling, *OR Spectr.* 36 (2014) 251–276.
- [104] C.M. Ringle, M. Sarstedt, D.W. Straub, Editor's comments: a critical look at the use of PLS-SEM in "MIS Quarterly", *MIS Q.* (2012) iii–xiv.
- [105] J.F. Hair, M. Sarstedt, C.M. Ringle, J.A. Mena, An assessment of the use of partial least squares structural equation modeling in marketing research, *J. Acad. Mark. Sci.* 40 (2012) 414–433.
- [106] C. Fornell, D.F. Larcker, Evaluating structural equation models with unobservable variables and measurement error, *J. Mark. Res.* 18 (1981) 39–50.
- [107] C.-Y. Lee, H.-Y. Chong, Q. Li, X. Wang, Joint contract–function effects on BIM-enabled EPC project performance, *J. Constr. Eng. Manag.* 146 (2020) 4020008.
- [108] J. Henseler, C.M. Ringle, M. Sarstedt, A new criterion for assessing discriminant validity in variance-based structural equation modeling, *J. Acad. Mark. Sci.* 43 (2015) 115–135.
- [109] W.W. Chin, The partial least squares approach to structural equation modeling, *Mod. Methods Bus. Res.* 295 (1998) 295–336.
- [110] J. Cohen, *Statistical power analysis for the social sciences*, (1988).
- [111] W.W. Chin, B.L. Marcolin, P.R. Newsted, A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/ adoption study, *Inf. Syst. Res.* 14 (2003) 189–217.
- [112] P.M. Bentler, D.G. Bonett, Significance tests and

- goodness of fit in the analysis of covariance structures., Psychol. Bull. 88 (1980) 588.
- [113] T.K. Dijkstra, J. Henseler, Consistent partial least squares path modeling, MIS Q. 39 (2015) 297–316.
- [114] M. Wetzels, G. Odekerken-Schröder, C. Van Oppen, Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration, MIS Q. (2009) 177–195.
- [115] R.M. Baron, D.A. Kenny, The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations., J. Pers. Soc. Psychol. 51 (1986) 1173.
- [116] K.J. Preacher, G.J. Leonardelli, Calculation for the Sobel test: An interactive calculation tool for mediation tests, (2001).
- [117] C. Nitzl, J.L. Roldan, G. Cepeda, Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models, Ind. Manag. Data Syst. (2016).
- [118] W.W. Chin, B.L. Marcolin, P.R. Newsted, A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/ adoption study, in: 17th Int. Conf. Inf. Syst. Cleveland, OH., 1996.
- [119] P. Ifinedo, The moderating effects of demographic and individual characteristics on nurses’ acceptance of information systems: A canadian study, Int. J. Med. Inform. 87 (2016) 27–35.
- [120] J.F. Dawson, Moderation in management research: What, why, when, and how, J. Bus. Psychol. 29 (2014) 1–19.
- [121] P.J. Leather, Safety and accidents in the construction industry: a work design perspective, Work Stress. 1 (1987) 167–174.

HOW TO CITE THIS ARTICLE

A. Katebi , Z. Alsadat Ardestani , A. Bordbar , *Competence and affective commitment as mediators of the effect of job characteristics on the performance of Iranian supervising engineers– supervising engineers’ perspective, AUT J. Civil Eng., 6(4) (2022) 493-508.*

DOI: 10.22060/ajce.2023.21997.5820

