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Generational Transformation and Its Reflection on Project Success: The Gen-Z

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ABSTRACT

Nowadays, Gen-Z members with a high ability to use high-tech products have just entered the labor market to take responsibility in construction projects. Gen-Z members must work together with other generations and different work styles. If the harmonization among generations is not managed properly, it will decrease the productivity of the construction industry. Therefore, this study aims to identify the Gen-Z characteristics and their impacts on the project success by using Structural Equation Modeling (SEM) method. SEM results showed that Gen-Z characteristics contribute to project success through communication. Therefore, communication-related practices must be overviewed and rearranged according to Gen-Z requirements. The findings will contribute to the in-company employee strategies and assist in adapting Gen-Z members into the construction industry to increase productivity.

Keywords: Construction industry, generation Z, innovation, performance management, human resource management.

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1. INTRODUCTION

The size of the global construction industry is expected to achieve $14 trillion by 2025. However, compared to other industries, the construction industry, in which the labor productivity growth is less than 1%, is the only industry that cannot improve its productivity over the past 50 years [54]. One of the underlying reasons why labor productivity suffers is the shortage of qualified workers and experienced managers in that field. These human resources-related issues also trigger quality issues in the construction industry [70]. Besides these, the loss of company intellectual capital depending on the aging population is one critical problem threatening the construction industry [11]. Moreover, the construction industry is currently facing a loss of experienced labor due to Covid-19, as in all industries. After the Covid-19 pandemic, some employees and employers either decide to shift their career paths to new jobs or make retirement decisions [11]. Therefore, companies are forced to bring multi-generations (Baby boomers, Generation X, Y, and Z) together to achieve their organizational targets [42] and to create a favorable environment to enable knowledge transfer to each other over the years for ensuring the continuity of the company. However, having employees from multi-generations with different working styles necessitates human resource management carefully. For example, Generation X is senior representatives of companies or employers. They are more autonomous, skeptical, and self-directed and require a balanced work-life. From these generations, Generation Y wants to get more responsibility at work and to know more details about their work, whereas Gen Z is more demanding and harder to manage because of the lifelong learning expectation from their endeavors and desire to improve their skills [9].

There are a significant number of models that represent a spectrum of employee motivation and corresponding management styles, such as “Theory of Needs”, “Intrinsic versus Extrinsic Motivation” and “Theory X, Theory Y, and Theory Z” [55]. According to the “Theory X, Theory Y, and Theory Z” model, members of Generation X lack ambition and goals to work for income, while members of Generation Y are intrinsically motivated and have leadership qualities. Gen-Z members, on the other hand, are driven by self-realization, values, and welfare [55]. As understood from these theories, managers must change their structure developing style regarding the relationship between internal employees and the management into a more individual or generation-focused manner.

Currently, Gen-Z members are working together with other generations and will form the future construction industry for ongoing 50 years. Additionally, in some sources, changes in the construction industry labor market are attributed to changes in the demographics of the construction industry [70] that arise from generational differences. Therefore, managers should raise their awareness of Gen-Z employees to develop effective management styles and sustain harmonization among multi-generations in the workplace [56]. Accurate management styles or strategies can turn working with Gen-Z into an opportunity while mismanaging or being insensitive can jeopardize project success. Therefore, it is inevitable to develop a managerial method for this generation rather than an order to be established by trial and error. Within this context, [42] stated that if employers respond to the needs of employees from different generations, they can benefit from their increased productivity. [15] stated that devising new strategies according to the needs of Gen-Z is crucial to accommodate Gen-Z in the workplace since their expectations, values, and anticipations are different. From the perspective of human resources practices, this generational transformation needs to be

managed for overcoming both the bleak picture of employment practices and the poor image related to workforce relations [68]. According to the authors, every generation has its values, and understanding these values is crucial to conceive the employment relationship [24]. Therefore, human resource managers and project managers should concentrate on generational differences [67], [68].

The literature review showed that there is one study investigating the effect of Gen-Z on the construction industry. In this study, [11] it is aimed to develop strategies to integrate Gen-Z into the construction industry only with a literature review. Based on this background, this study aims to identify the characteristics of Gen-Z and understand the impact of Gen-Z on project success by using the Structural Equation Modeling (SEM) method. In this study, two hypotheses given below will be mainly investigated:

1. There is a direct relationship between Gen-Z characteristics and project success.

2. There is a direct relationship between the innovational impact of Gen-Z and project success.

The results of this study will be a crucial gain for the construction industry to accurately analyze the characteristics of Gen-Z. With the developing technologies and changes in labor sources, the efficient and productive work of different generations has become a matter of curiosity for companies. Thus, the results obtained from this study would pioneer the development of new methods and increase employee satisfaction and project success.

2. LITERATURE REVIEW ON PREVIOUS GEN-Z STUDIES

In the literature, various studies were performed to describe the attitudes and behaviors of Gen-Z in the workplace. However, their attitudes, values, and behaviors remain a mystery, especially in the construction industry. In line, research on the impact of Gen-Z is limited, especially in the context of the construction industry. Table 1 summarizes hitherto studies on Gen-Z in terms of their research topics and findings.

Table 1 - The literature review about Gen-Z.

Research topics	Findings	References
Main characteristics of Gen-Z	Positive, problem solver, innovator, out-of-the-box thinker, negative if the accommodation period is less than one year, assimilative for organizational values, ability to reach new markets, engaging automation design for work, and fast learner, self-confident, creative, career-focused, result-oriented and precision, better at IT knowledge, have powerful technical and language skills compared to other generations	[9], [56], [41]

Workplace attitudes of Gen-Z	Expectations related to the workplace can be different within Gen-Z individuals. In line, the authors emphasized that there is a diversity of Gen-Z's workplace motivations in the same generation cohort.	[9], [37]
	Gen-Z is attracted via flexible work practices, reward and recognition, compensation and benefits, feedback-seeking behavior, and volunteering work.	[2], [32]
	Gen-Z is more open to sharing their personal information with others. Moreover, they prefer to take advice from their friends, family members, or peers rather than superiors.	[36]
	Work environment, compensation, and work-related issues are the most important aspects of a job search situation.	[51]
Motivators/Expectations of Gen-Z in the Workplace	Gen-Z seeks financial stability and extrinsic regulation material. Furthermore, they are more committed employees, and their intrinsic motivation is higher than other generations.	[42]
	Gen-Z seeks transparency, self-reliance, flexibility, personal freedom, acknowledgment, respect for thoughts and ideas, development opportunities, building several parallel careers, flexible schedules, feedback, and maintaining a personal life.	[13]
	Finding the dream job, entrepreneurial initiative, creativity, innovation, opportunities to expand skills, career-minded, and taking delight.	[41]
Communication habits among Gen-Z members	Gen-Z creates its own documents/databases, uses the web for research, and uses e-mail/IM/text as the main communication method.	[13], [31]
Relationship between project management competencies and Gen-Z	Gen-Z traits are more related to project management with soft skills.	[41]
Relationship between organizational belonging and Gen-Z	The feeling of belonging to an organization is a mediation factor between a self-directed, boundaryless attitude and the Gen-Z turnover intention.	[12]

The literature review shows that numerous studies have dealt either with the main characteristics of the Gen-Z or the workplace attitudes of Gen-Z to make suggestions about managerial actions to attract, motivate and retain the Gen-Z. Since the main characteristics of Gen-Z and their workplace attitudes have been well discussed in the literature, there is a lack of rigorous literature to determine the project success impact of Gen-Z and its investigation specific to the construction industry.

3. IDENTIFICATION OF FACTORS AFFECTING PROJECT SUCCESS IMPACT OF GEN-Z

This study aims to identify the characteristics of Gen-Z and to understand the project success impact of Gen-Z using the Structural Equation Modelling (SEM) method. Therefore, indicators related to the characteristics of Gen-Z and project success were examined. Depending on the literature review, a questionnaire was created to implement the SEM method. In this section, factor structures and their variables were introduced. Table 2 demonstrates the model consisting of 6 factors, namely the Innovation Input Factor, Psychological Factor, Working Area Behavioural Factor, Communication Factor, Gen-Z Characteristics Factor, and Project Success Factor. These factors consist of a total of 23 different variables determined from the literature, which affect the interoperability of Gen-Z and other generations and determine the character of Gen-Z.

Table 2 - Definition of factors and variables.

Factors	Variables	Definitions	References
Working Area Behavioral Factor (WRK)	WRK1-Positive approach to new ideas	A positive attitude toward new ideas	[61], [21]
	WRK2-Knowing what they are good at	Knowing their predispositions and limits Ready for the challenges and testing themselves	
	WRK3-Realistic approach	Observed with a tendency of Gen-Z's addiction to social media	
Communication Factor (CMN)	CMN1-Ability to express themself	Shaped by watching the contents of the peers on the internet	[39], [7], [22], [59]
	CMN2-Setting an equal style in the communication method	Focusing on freedom and equality during communication	

	CMN3-Dialogue rather than discussion	Tendency to the dialogue due to libertarian and equal views of Gen-Z	
Psychological Factor (PSC)	PSC1-Social effects of growing up in a protective family	Parents of Gen-Z are more protective and achievement-oriented.	[59], [56], [2],[49]
	PSC2-Psychological support	The rates of anxiety and depression requiring psychological support are higher among Gen-Z.	
	PSC3-Support about awareness of the limits	Gen-Z members need psychological assistance to discover their limits in the business environment.	
	PSC4-Reliance on research rather than rumors	Gen-Z members are the most active users of the internet. They take note of the studies and proven facts rather than tacit knowledge.	
Gen-Z Characteristics Factor (GENZ)	GENZ1-Initial role	The members of Gen-Z regard success as making a difference. Also, they perceive themselves as initiator.	[41], [42], [56], [52], [34], [9]
	GENZ2-Ability to internalize client requests	Gen-Z has a positive approach to listening to other people's thoughts. Therefore, they are open to the ideas and requests of clients.	
	GENZ3-Do it yourself generation	The members of Gen-Z are ambitious and individualist.	
	GENZ4-Leadership abilities	The leadership abilities of the members of Gen-Z were found higher than neutral points.	
	GENZ5-Technology sophistication	Gen-Z has better IT knowledge than other generations.	

Innovation Input Factor (INV)	INV1-Freedom in working method	The members of Gen-Z demand more flexibility in their working methods to support their desire for work.	[9], [5], [56], [13], [1], [2],
	INV2-Original thinking ability	The members of Gen-Z are out-of-the-box thinkers against other generations.	
	INV3-Knowledge	They have more tendency to use web resources to invent or discover something.	
	INV4-Investment	Investment is one of the most important triggering factors for innovations.	
	INV5-Consultancy	Constant feedback requirement is one of the attributes of Gen-Z. It is also crucial for innovations.	
Project Success Factor (PSS)	PSS1-Decrease in project duration	Shortening the project length in the construction industry is one of the most decisive indicators of project success.	[26], [5], [50], [51] [7], [35], [16]
	PSS2-Decrease in project cost	Cost management of construction projects is essential in determining the income-expense balance of the project from a holistic perspective.	
	PSS3-Increase in client satisfaction	Sectors continue their existence by making, developing, and facilitating what people want. Nowadays, with the increasing level of modernity, consumer expectations are dynamically changing.	

4. RESEARCH METHODOLOGY

This study aims to identify the characteristics of Gen-Z and to understand the project success impact of Gen-Z using the Structural Equation Modelling (SEM) method. The SEM method is frequently used to investigate the relationships between dependent and independent variables. This method is defined as a combination of exploratory factor analysis, confirmatory factor analysis, and path analysis, as it includes observed and latent variables at the same time [66]. While confirmatory factor analysis tests whether the created models are validated on the data set, Path analysis is the analysis of many simultaneous regression equations among observed variables [20]. In other words, SEM shows direct or indirect relationships between latent variables. SEM method can be used to estimate the error

variance, to consider unobservable variables or phenomena, to present a holistic model, to test the model holistically, to perform operations on data sets that are not normally distributed and with missing data, and to allow simultaneous testing of the connection between dependent and independent variables [3]. Therefore, this study employed the SEM method to discover relationships between the characteristics of Gen-Z and project success.

4.1. Data Collection

A data set of the study was collected from 144 construction workers born between 1994-2010 (members of Gen-Z) by conducting face-to-face surveys. Participants were from different disciplines such as field engineers, architects, technical office engineers, and contract engineers. The relevant sample set was found to be sufficient to perform SEM analysis (sample set > 5 observations*23 variables = 115) [69]. The survey study consists of two separate parts. General information about the participants was collected in the first part of the questionnaire. In the second part, participants were asked to evaluate model indicators using a 1-5 Likert scale (1 represents I disagree, 5 represents I strongly agree).

4.2. Data Analysis

As stated above, the SEM analysis consists of a normality test, exploratory factor analysis, confirmatory factor analysis, and path analysis (structural analysis). In this study, IBM SPSS Statistics V21 and IBM SPSS AMOS V21 programs were used to perform statistical and SEM analyses.

4.2.1. Normality Test and Exploratory Factor Analysis

Before starting the analysis, the normality distribution test of the data sets was performed. It is stated in the literature that the Barlet test, Skewness and Kurtosis value, and one of the Liliegor tests can be used to test the normality distribution since the model goodness-of-fit indices will not give good results and the analysis results will be affected by this distribution if the data is not normally distributed. Within the scope of the study, Skewness and Kurtosis tests were used. This value is expected to be between -1.5 and +1.5 [63]. The Skewness and Kurtosis values of all variables considered within the scope of the study are within the value range specified in the literature [17].

If the researcher does not know the exact relationship between the observed and the unobservable variable and does not take factor groups from the literature, the researcher needs to perform exploratory factor analysis [65]. The survey questions used to create the variables under the factor groups in the study were determined as a result of the literature review. However, since the variables in question were not completely included in the study and the accuracy of the factor structures was not tested, exploratory factor analysis was performed, and the data analysis was started [62]. Thanks to factor analysis, the variables that are thought to be related can be grouped under a smaller number of unobservable variables.

Kaiser-Mayer-Olkin (KMO) measurement of sampling adequacy value and Bartlett's test of sphericity were checked to measure the correlations between the variables and the suitability of the factor analysis in exploratory factor analysis, respectively. The KMO value should be between 0 and 1. The closer the KMO value is to 1, the more suitable the sample is for factor

analysis. A KMO value of 0.8 and above is excellent, while a value below 0.5 is unacceptable [62]. In this context, the result of the KMO test was found to be 0.773. The Bartlett test, on the other hand, decides whether the correlation between the variables is sufficient. As a result of the Bartlett test, the significance value (p value) is expected to be below 0.05. In this context, the p value was found to be 0.00. This result proved that there is a relationship between the variables and the underlying structure [27].

Revealing the anti-image correlation matrix specific to the data set is one of the essential criteria for factor analysis. While performing the factor analysis, rotation was performed to show in which factor clusters the variables were collected more intensively. In this context, the varimax option was chosen because it was thought that there was a relationship between the factor structures [25].

Another crucial criterion for factor analysis is that the explained variance value should exceed 50% of the total variance. In this context, as a result of the exploratory factor analysis, it was determined that the relevant factor group explained 65,975% of the total variance, and it was found to be greater than 50%. Factor loadings above 0.2 are acceptable for modeling [14]. This limit is provided in the model [27].

Cronbach's Alpha values were checked to measure the reliability of the factor groups that emerged as a result of the exploratory factor analysis. In this context, this value is expected to be at least 0.7 [66]. However [40] stated that Cronbach's Alpha value can be acceptable if it is between 0,5 and 0,7. The findings showed that the results are admissible. Table 3 demonstrates a summary of the analysis results.

Table 3 - The exploratory factor analysis results

Factor Groups	**Code**	**Variable Definitions**	**Factor load**	**Cronbach Alpha Value**
Working Area Behavioral Factor (WRK)	WRK1	Positive approach to new ideas	0,835	0,808
	WRK2	Knowing what they are good at	0,825	
	WRK3	Realistic Approach	0,761	
Communication Factor (CMN)	CMN1	Ability to express themselves	0,803	0,894
	CMN2	Setting an equal style in communication method	0,887	
	CMN3	Dialogue rather than discussion	0,887	
Psychological Factor (PSC)	PSC1	Social effects of growing up in a protective family	0,828	0,738
	PSC2	Psychological support	0,870	
	PSC3	Support about awareness of the limits	0,660	
	PSC4	Reliance on research rather than rumors	0,593	

Generation Z Characteristics Factor (GENZ)	GENZ1	Initial role	0,699	0,830
	GENZ2	Ability to internalize client request	0,446	
	GENZ3	"Do it yourself" generation	0,730	
	GENZ4	Leadership Abilities	0,744	
	GENZ5	Technology sophistication	0,830	
Innovation Input Factor (INV)	INV1	Freedom in working method	0,649	0,783
	INV2	Original thinking ability	0,697	
	INV3	Knowledge	0,749	
	INV4	Investment	0,729	
	INV5	Consultancy	0,748	
Project Success Factor (PSS)	PSS1	Decrease in Project duration	0,850	0,797
	PSS2	Decrease in Project cost	0,800	
	PSS3	Increase in client's satisfaction	0,830	

According to Table 3, all factor groups' Cronbach's Alpha Values are over 0.7, meaning that they are all acceptable values.

4.2.2. Confirmatory Factor Analysis

Confirmatory factor analysis can also be named as the measurement model in literature [62]. Confirmatory factor analysis helps to reveal the relationship between the factor structures that are revealed as a result of exploratory factor analysis and to confirm the resulting structures. Within the scope of confirmatory factor analysis, the AMOS package program was used. Therefore, the errors that occur in the model should be revealed with standardized residuals, modification indices, and conformity tests. If the analysis results provide the conditions, a structural model is used to create the path model, and the structural analysis is performed [8].

"Covariance correction" and "regression correction" indices are items of modification indices [8]. In this context, both covariance correction indices and regression correction indices were checked. In the analysis performed under the covariance correction indices, the highest covariance values (9,504) were found among the error terms of GENZ2 and GENZ4. As a result of the regression analysis, the highest regression was found between GENZ2 and PSC3 variables (9,547). If the Chi-square test value is higher than 2 or 3, these values are used to improve the model by making corrections on the relevant variables [33], [30]. In this context, the result of the confirmatory factor analysis showed that the Chi-square test value is 1.288. Therefore, there is no need for correction on the model.

The fitness indices were examined to test the accuracy of the factor structures. There is no consensus in the literature for selecting certain fitness indices and using them as a confirmatory factor or structural model analysis evaluation criteria. In this context, in this

study, the Chi-square, the goodness-of-fit statistic, the goodness-of-fit index (GFI), the comparative fit index (CFI), and the root mean square of approximation (RMSEA) indices were used.

Chi-square the goodness-of-fit statistic is calculated by dividing the Chi-square value by the degree of freedom. The goodness-of-fit index that was described by Jöreskog and Sörbom in 1984 is another index to measure model fit. The formula for GFI is given in Eq. 1. According to the notation of the formula, $\Sigma\hat{}$ represents the estimated covariance matrice matrix for observed variables from the restricted model, S represents the covariance matrice from the unrestricted model, and tr( ) represents the sum of diagonal elements [48].

$$GFI = 1 - \frac{tr\left(\hat{\Sigma}^{-1}S - I\right)^2}{tr\left(\hat{\Sigma}^{-1}S\right)^2} \quad (1)$$

The CFI is used to measure relative improvement from the baseline model to the postulated model (Eq. 2). In Eq. 2, while Fk represents the postulate model, F0 represents the baseline model [61].

$$CFI = 1 - \frac{F_k}{F_0} \quad (2)$$

The RMSEA helps to measure discrepancy per degree of freedom. The equation of RMSEA is given in Eq. 3. In Eq. 3, F_k represents the discrepancy between the population covariance matrix and the implied covariance matrix, df_k denotes the degree of freedom [61].

$$RMSEA = \sqrt{\frac{F_k}{df_k}} \quad (3)$$

In this context, Table 4 demonstrates the results obtained from the AMOS software. The analysis results showed that all indices are within limits.

Table 4 - Control of conformity index results of confirmatory factor analysis.

Compatibility Indices	Literature	Results	Reference
χ2/df	<3	<3	[26]
GFI	0= no fit ; 1= perfect fit	0= no fit ; 1= perfect fit	[61]
CFI	0= no fit ; 1= perfect fit	0= no fit ; 1= perfect fit	[61]
RMSEA	<0,1	<0,1	[34]

Additionally, the construct reliability of the latent variables was measured via Construct Reliability (CR) analysis. This analysis helps to evaluate the inner quality of the model. The values of CR need to be higher than 0,7. The analysis results are shown in Table 5.

Table 5 - The composite reliability values (CR).

Working Area Behavioral Factor	Communication Factor	Psychological Factor	Generation Z Characteristics Factor	Innovation Factor	Project Success Factor
0,815	0,897	0,773	0,811	0,786	0,802

4.2.3. Path Analysis (Structural Model Analysis)

When the factor loadings and the goodness fit indices for the model were not improved with the change in the model through literature studies, and factor loadings and the goodness fit indices were within acceptable limits, the structural model analysis ended [45], [28]. More technically, in structural analysis, the quantification of the explained and unexplained variance between latent variables is performed [29]. The structural model emerges by combining one or more linear regression equations. The analysis results of coefficients are called the path for co-efficiency [8].

SEM analysis is used in the literature to analyse latent variables which cannot be measured directly. In this context, the relationship between the latent variables "Innovation Factors", "Psychological Factor", "Working Area Behavioral Factors", "Communication Factors", "Gen-Z Characteristic Factors", and "Project Success Factors" was analysed with IBM AMOS V21. As a result of the analysis, the fitness indices of the model remained within the allowed ranges (Table 6).

Table 6 - Control of conformity index results of structural model analysis.

Compatibility Indices	Literature	Results	Reference
CMIN/df	<3	1,267	[61]
GFI	0= no fit ; 1= perfect fit	0,857	[61]
CFI	0= no fit ; 1= perfect fit	0,951	[61]
RMSEA	<0,1	0,043	[34]

As a result of the structural analysis, the significance levels of the path coefficients were also tested with the t-test. All p-values below 0.05 were significant [8].

Before the SEM analysis, the model was used to analyse the relationship between factor groups and to measure the factor loads. After the SEM analyses, the model shows the factors and variables to measure the impact of Gen-Z Characteristics on innovations in the construction industry (Figure 1). The arrows represent the effecting direction of factors, and the numbers on the arrows are factor loads.

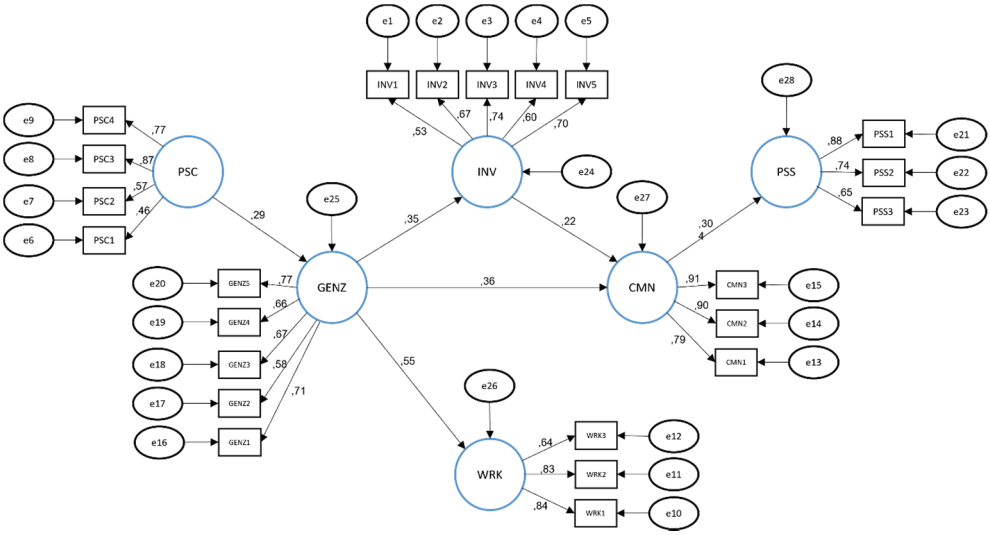

Figure 1 - Results of Structural Equation Model Analysis

As a result of the SEM analysis, it was determined that the "Innovation (INV)" factor group affects the "Communication (CMN)" factor group. It was observed that the "Psychological (PSC)" factor group affects the "Gen-Z Characteristic (GENZ)" factor group. The "Work Area Behavioral (WRK)" factor is affected by the "Gen-Z Characteristic (GENZ)" factor group. Finally, the "Communication (CMN)" factor group has a mediator role between the "Innovation (INV)", "Gen-Z Characteristic (GENZ)" and "Project Success (PSS)" factor groups.

The highest factor loads were found in the "Knowledge" variable (0.74) under the "Innovation factor", "Support about awareness of the limits" variable (0.71) under the "Psychological factor", "Psychological support" variable (0.87) under the "Working area behavior factor", "Setting an equal style in communication method" variable (0.90) under the "Communication factor", "Technology sophistication" variable (0.77) under the "Gen-Z Characteristic factor", and "Decrease in Project duration" variable (0.88) under the "Project success factor".

5. DISCUSSION

The study aimed to identify the characteristics of Gen-Z and to understand the impact of Gen-Z on project success by using the Structural Equation Modelling (SEM) method. The SEM analysis showed that communication management is the key to achieving project success. In other words, the "There is a direct relationship between Gen-Z characteristics and project success" and "There is a direct relationship between the innovational impact of Gen-Z and project success" hypotheses were rejected. However, their indirect impacts on "project success" were discovered via the "communication" factor.

The nature of construction projects requires a collaborative working environment in which different expertise is shared and combined to construct physical buildings. Within this context, teams are built up and dissolve during the building life cycle. Moreover, each team has its own project managers, who are engaged from different organizations and their complicated bureaucracy. Therefore, the harmony and interconnection between teams, in-team relationships (including intergenerational communication [42]), and expectation management of stakeholders are crucial to achieving project success in construction projects [19]. According to the results of this study, Gen-Z members who are internal project stakeholders demand more open communication to motivate themselves to conduct project-related activities since they have grown up in an era of social media and digital communication where collaboration and teaming are important. In other words, they demand open communication channels to express themselves in problem-solving and implementing innovative ideas. Thus, the Gen-Z members can feel that they are the part of the solution. However, the construction industry is less innovative, transparent, and highly bureaucratic than other industries. Therefore, neglecting the communication-related factors in the project will cause innovative ideas to vanish or the innovation impact of Gen-Z to vanish. Acknowledging and managing these differences is crucial to creating a positive work culture and improving motivation for integrating Gen-Z members into the construction industry [42].

As Figure 1 displays, Gen-Z individuals value sincere relations rather than hierarchical order. Hence, it will be beneficial to perform project meetings, team lunches, office debates, and team-building activities such as the blind retriever game, perfect square game, two truths-one lie game, et cetera. These activities will increase sincerity, communication, creative thinking, teamwork, and building relationships in construction projects. In construction projects, the selection of communication tools may also help to increase sincerity for Gen-Z members. Since they have more familiarity with mobile applications. In other words, apart from the e-mail communication as a channel, using more common and daily communication networks (WhatsApp, Telegram, et cetera.) can contribute to communication success in organizations. However, considering the majority of Gen-Z are distracted while using their smartphone for non-work-related activities [31] [53], the selection of workplace communication tool's effect on employee productivity comes to the forefront as a serious issue.

Furthermore, the global construction industry suffers from productivity losses. In this context, improving the performance and productivity of the labor force are key elements for the successful completion of construction projects [44]. Productivity is related to how efficiently resources are used to achieve organizational goals [44]. Therefore, the effective use of Gen-Z and their abilities will affect the future of construction industry. According to the study results, members of the Gen-Z demand support for using their "technology sophistication" in construction tasks. Therefore, Gen-Z, digital natives [64], can be utilized to improve the low digitalization level of the construction industry and productivity in construction projects. Considering technological advances such as BIM, IoT, AR, VR, and Robotics, adopting Construction 4.0 emerges as one of the necessities the construction industry should achieve. However, due to the conventional manufacturing type of the industry, it is challenging for construction companies to adopt Construction 4.0. Within this context, Gen-Z has impromptu technology that can fuel companies' growth and success [2]. However, while integrating Gen-Z into construction projects to increase innovation, "psychological support" needs to be given to them since Gen-Z members depend on support due to high anxiety and depression [59, 56]. This psychological support may include actions

to increase their motivation. Rather than a reward or punishment system, motivational sources such as an arrangement of working hours by themselves or participating in training may be more convenient to increase their job commitment.

Because of the fragmented structure of construction projects, high labor turnover is another issue in the construction industry. The high labor turnover may directly cause to need for coaching support to reduce Gen-Z members' job loss perception. Therefore, as individuals distance themselves from anxiety, work-related stress, and overwhelming workloads, productivity increases in Gen-Z can be observed. In other words, prioritizing the mental health and well-being of Gen-Z can influence the efficiency of the project [60]. However, fostering a supportive environment where they can freely express themselves by setting an equal dialog must be considered with the supportive working environment. Furthermore, the industry's poor image regarding workforce perception often results in hiring low-educated laborers, potentially leading to communication competence issues among employees. Therefore, communication should be prioritized to fill the gap and use the effectively in construction activities.

The analysis results interestingly showed that "working area behaviour" did not have a direct effect neither on the success of the project, or innovation input factor. The underlying reason behind this result can be that "WRK2-knowing what they are good at" and "WRK3-Realistic approach" discourage them to participate in innovations, and the reluctance endangers project success directly. Also, this finding confirms the importance of communication factors to courage them. The importance of WRK2 (knowing what they are good at) in the study shows that the awareness of the GENZ members and their potential in the job is high. Regarding the construction industry, construction projects are complex and contain a high degree of uncertainty. Within this context, the Gen-Z member's realistic approach can help perform due diligence on the project.

Psychological factors are one of the subcomponents of effective leadership (the second most essential indicator under the Gen-Z characteristics factor) in the project-based environment [57]. Also, this finding can be seen in the effect of the PSC factor on the Gen-Z characteristics factor. Another important finding in the literature is that psychological factors play an important role in entrepreneurship [38]. Entrepreneurship is related to leading change. Being entrepreneurship can be attributed to the initiator role and "Do it yourself" characteristics of Gen-Z. Therefore, it can be inferred that psychological factors affect Gen-Z characteristics.

As a consequence, employers should let Gen-Z employees share their knowledge and opinions. Communication among colleagues will help improve Gen-Z's mental health and well-being and support the innovativeness of companies and project success. Furthermore, when things go wrong, candid communications at the friend level rather than as a manager may be more helpful to explain themselves and allow them to correct themselves.

6. CONCLUSION

The construction industry's workforce comprises individuals from multiple generations. Among these, Gen-Z stands out due to its proficiency with high technology and entrepreneurial attributes. Leveraging the potential of Generation Z within the construction sector holds promise for addressing long-standing industry challenges. However, the

literature review analysis showed that the study has focused on the relationship between Gen-Z characteristics and project success. Within this context, 23 variables under 6 factors were identified at the end of the literature review. 144 surveys were collected, and the collected data were analyzed according to the SEM methodology to discover the factor groups and the relationship between factors. As a result of SEM analysis, the direct relationship between Gen-Z and project success was not found. Instead, it uncovered the mediating role of the "Communication" factor. Additionally, our findings underscore the significant influence of Gen-Z on fostering “Innovation” within the construction industry, while also shedding light on the impact of “Psychological” factors on Gen-Z.

As a result of the analysis, the below inferences can be made from the study:

- Granting Gen-Z members autonomy in their work methods can significantly enhance productivity [9, 13]. Conversely, prolonged working hours have been shown to decrease productivity and elevate stress levels [30]. Moreover, research suggests that remote work fosters creativity. Various strategies exist to promote work-life balance, such as part-time employment, flexible schedules, transportation assistance, and adaptable job arrangements, which construction companies can implement to boost productivity [6]. Within this context, reducing onsite work hours for construction workers not only mitigates health and safety risks but also enhances the innovative capacity and productivity of Gen-Z individuals [43]. Construction firms should leverage evolving technological opportunities and implement improvements beneficial to employees' mental well-being to incorporate these forward-looking strategies as much as possible.

- Gen-Z members should not solely rely on online information but also communicate with their more experienced colleagues to fulfill their practical information needs. In this context, brainstorming sessions can prove beneficial in enhancing the creativity and productivity of Gen-Z during idea-generation sessions [4]. Moreover, Gen-Z members are highly familiar with the use of new technologies. These brainstorming sessions might facilitate their sharing of technical knowledge with colleagues. Simultaneously, as experienced colleagues offer solutions to problems, this interaction could support the learning process of Gen-Z members.

- This study has shown that the counselling effect needed to psychologically support Gen-Z members is also a necessary input for innovation. Therefore, coaching, and mentoring programs can be helpful in uncovering talents. There are different types of coaching programs, such as external coaches and coaching in an organization, made by managers. In this study, the authors propose using internal coaching made by managers so that managers can optimize individual and organizational goals with employees by aligning them. Besides, managers can give constructive feedback about Gen-Z members’ progress at work. Thus, the positive impact of coaching programs on employee satisfaction, individual performance, and organizational goals can be realized [47].

- The members of Gen-Z are aware that they need investment to put their ideas into practice, and if their ideas are innovatively acceptable and viable, it is of great importance to support these ideas with investment. Therefore, construction companies should allocate funds in their budgets for their employees to innovate [18].

- Furthermore, understanding their areas of success can foster a greater appreciation for business life among Gen-Z members, motivating them to strive for continuous improvement in their work. In this regard, facilitating interdepartmental transfers can help unearth their potential and contribute to organizational learning [10]. For instance, if a Gen-Z member is dissatisfied with their current position or experiencing low productivity, assigning them tasks in a different department could potentially boost their effectiveness and creativity. Additionally, Norman's (1986) Gulf of Evaluation and Execution method, typically utilized in Information Systems (IS) development and evaluation, can be adapted to assess and enhance Gen-Z members' retention within organizations [23]. By applying this method, any disparities between employee intentions, particularly those of Gen-Z members, and organizational objectives can be identified. If misalignments are detected, it is essential to evaluate whether the Gen-Z members' expectations are beneficial to the organization. In such cases, organizational adjustments should be considered to align with their expectations effectively. For construction companies, implementing such a method can aid in pinpointing any mismatches between the intentions of employees, especially those belonging to Gen-Z, and the overarching objectives of the organization. Upon identifying such discrepancies, it becomes imperative to assess the extent to which the expectations of Gen-Z members contribute positively to the organization's goals. In instances where their expectations prove advantageous, it is crucial for construction firms to contemplate organizational adjustments that effectively align with these expectations. This alignment is essential for fostering a work environment conducive to the productivity and satisfaction of Gen-Z employees within the construction industry.
- The characteristics of Gen-Z are open to new ideas. However, since they think about events from their perspectives and reach conclusions this way, what they do or think does not appear as a result of other people's ideas or wishes, but as an inference from their perspectives. Therefore, two-way communication between Gen-Z members and experienced workers or managers should be used as a facilitator to convince them. If managers choose one-way communication, Gen-Z members will not be willing to share their ideas. In other words, managers or colleagues give them a chance to say something about their jobs and lives. This enablement also helps the engagement of Gen-Z. Besides these, sharing power with Gen-Z members can strengthen the sense of belonging [46].
- Managers must keep their social communication levels at equal level and ensure that two employees at the same level pay attention to this level, even if they are from different generations. Within this context, the expectations of Gen-Z members from organizations are different in terms of organizational structures. They are expected to work in horizontal organizational structures (deciding without getting manager approval) [43].

The model proposed as a result of SEM analysis can be used to integrate Gen-Z members into construction companies in a way that more innovation is obtained. Moreover, using the study outputs with some recommendations can increase the efficiency of Gen-Z in construction projects. Eventually, the proposed model can be used to measure the performance of the innovational impact of Gen-Z and their impact on project success in the construction industry. Especially since the effect of field workers on productivity is high in the construction sector, research can be conducted on how Gen-Z can become more productive than the workers working as other generations.

References

[1] Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: A review. *International journal of management reviews*, 8(1), 21-47.

[2] Aggarwal, A., Sadhna, P., Gupta, S., Mittal, A., & Rastogi, S. (2020). Gen Z entering the workforce: Restructuring HR policies and practices for fostering the task performance and organizational commitment. *Journal of Public Affairs*, e2535.

[3] Aladag, H., Demirdogen, G. and Isik, Z. (2021), "Investigation of dispute factors and effects on construction projects arising from COVID-19 pandemic as a force majeure event", *Journal of the Faculty of Engineering and Architecture of Gazi University*, 36(3), 1214-1228.

[4] Al-Samarraie, H., & Hurmuzan, S. (2018). A review of brainstorming techniques in higher education. *Thinking Skills and creativity*, 27, 78-91.

[5] Aouad, G., Ozorhon, B., & Abbott, C. (2010 Aouad: Directions and implications for research and policy. *Construction innovation*. 10(4), 374-394.

[6] Apraku, K., Bondinuba, F. K., Eyiah, A. K., & Sadique, A. M. (2020). Construction workers work-life balance: A tool for improving productivity in the construction industry. *Social Work and Social Welfare*, 2, 45-52.

[7] Arashpour, M., & Arashpour, M. (2015). Analysis of workflow variability and its impacts on productivity and performance in construction of multistory buildings. *Journal of Management in Engineering*, 31(6), 1-9.

[8] Bacon, L. D. (1994). Using Amos for structural equation modeling in market research. *SPSS white paper*, 1-18.

[9] Bencsik, A., Horváth-Csikós, G., & Juhász, T. (2016). Y and Z Generations at Workplaces. *Journal of competitiveness*, 8(3), 90-106.

[10] Boone, T., & Ganeshan, R. (2008). Knowledge acquisition and transfer among engineers: Effects of network structure. *Managerial and Decision Economics*, 29(5), 459-468.

[11] N. Borg and N. Scott-Young, C. Naderpajouh, "Managing to Retain Generation Z in the Construction Industry," in *44th Australasian Universities Building Education Association Conference*, 2021, pp. 109–119.

[12] Botezat, E., Fotea, S. L., Marici, M., & Fotea, I. S. (2020). Fostering the Mediating Role of the Feeling of Belonging to an Organization Among Romanian Members of Gen-Z . *Studia Universitatis Vasile Goldiș Arad, Seria Științe Economice*, 30(4), 69-91.

[13] Bucovețchi, O., Slușariuc, G. C., & Činčalová, S. (2019). Generation Z-Key Factor For Organizational Innovation. *Quality-access to success*, 20.

[14] Child, D. (2006). *The essentials of factor analysis*. A&C Black.

[15] Chillakuri, B. (2020). Understanding Generation Z expectations for effective onboarding. *Journal of Organizational Change Management*, 33(7), 1277-1296.

[16] Dawes, J., Stocchi, L., & Dall'Olmo-Riley, F. (2020). Over-time variation in individual's customer satisfaction scores. *International Journal of Market Research*, 62(3), 262-271.

[17] Desgagné, A., & Lafaye de Micheaux, P. (2018). A powerful and interpretable alternative to the Jarque–Bera test of normality based on 2nd-power skewness and kurtosis, using the Rao's score test on the APD family. *Journal of Applied Statistics*, 45(13), 2307-2327.

[18] Doran,J. & Ryan,G.(2017).The role of stimulating employees' creativity and idea generation in encouraging innovation behaviour in Irish firms. *The Irish Journal of Management*, 36(1) 32-48.

[19] Faraji A, Rashidi M, Perera S, Samali B. Applicability-Compatibility Analysis of PMBOK Seventh Edition from the Perspective of the Construction Industry Distinctive Peculiarities. *Buildings*. 2022; 12(2):210.

[20] Fornell, C., Larcker, D.F., 1981. Structural equation models with unobservable variables and measurement error: algebra and statistics. *J. Mark. Res*. 18 (3), 382–388.

[21] Francis, T., & Hoefel, F. (2018). True Gen': Gen-Z and its implications for companies. *McKinsey & Company*, 12.

[22] Gaidhani, S., Arora, L., & Sharma, B. K. (2019). Understanding the attitude of Gen-Z towards workplace. *International Journal of Management, Technology and Engineering*, 9(1), 2804-2812.

[23] Gemino, A., & Wand, Y. (2004). A framework for empirical evaluation of conceptual modeling techniques. *Requirements Engineering*, 9, 248-260.

[24] Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International journal of psychology*, 49(3), 141-157.

[25] Goretzko, D., Pham, T. T. H., & Bühner, M. (2021). Exploratory factor analysis: Current use, methodological developments and recommendations for good practice. *Current Psychology*, 40(7), 3510-3521.

[26] Gunduz, M., & Yahya, A. M. A. (2018). Analysis of project success factors in construction industry. *Technological and Economic Development of Economy*, 24(1), 67-80.

[27] Howard, M. C. (2016). A review of exploratory factor analysis decisions and overview of current practices: What we are doing and how can we improve?. *International Journal of Human-Computer Interaction*, 32(1), 51-62.

[28] Iacobucci, D. (2009). Everything you always wanted to know about SEM (structural equations modeling) but were afraid to ask. *Journal of Consumer Psychology*, 19(4), 673-680.

[29] Ikediashi, D. I., Ogunlana, S. O., & Udo, G. (2013). Structural equation model for analysing critical risks associated with facilities management outsourcing and its impact on firm performance. *Journal of Facilities Management*, 11(4), 323-338.

[30] Jaiswal, A., & Arun, C. J. (2020). Unlocking the COVID-19 lockdown: work from home and its impact on employees.

[31] Janssen, D., & Carradini, S. (2021). Gen-Z workplace communication habits and expectations. *IEEE Transactions on Professional Communication*, 64(2), 137-153.

[32] Jayathilake, H. D., Daud, D., Eaw, H. C., & Annuar, N. (2021). Employee development and retention of Generation-Z employees in the post-COVID-19 workplace: a conceptual framework. Benchmarking: *An International Journal*, 28(7), 2343-2364.

[33] Kärnä, S., Junnonen, J. M., & Sorvala, V. M. (2009). Modelling structure of customer satisfaction with construction. *Journal of facilities management*, 7(2), 111-127.

[34] Kirpik, G. (2020). Entrepreneurship, professionalism, and leadership intention of Gen-Z : The case of Kahta. *SEISENSE Journal of Management*, 3(2), 58-72.

[35] Kog, Y. C., & Loh, P. K. (2012). Critical success factors for different components of construction projects. *Journal of construction engineering and management*, 138(4), 520-528.

[36] Lazányi, K., & Bilan, Y. (2017). Generetion Z on the labour market: do they trust others within their workplace?. *Polish Journal of Management Studies*, 16(1), 78-92.,

[37] Leslie, B., Anderson, C., Bickham, C., Horman, J., Overly, A., Gentry, C., & King, J. (2021). Gen-Z perceptions of a positive workplace environment. *Employee Responsibilities and Rights Journal*, 33(3), 171-187.

[38] Li, J., Qu, J., & Huang, Q. (2018). Why are some graduate entrepreneurs more innovative than others? The effect of human capital, psychological factor and entrepreneurial rewards on entrepreneurial innovativeness. *Entrepreneurship & Regional Development*, 30(5-6), 479-501.

[39] Loosemore, M. (1998). The influence of communication structure upon management efficiency. *Construction Management & Economics*, 16(6), 661-671.

[40] Ma, Z., Pi, G., Dong, X., & Chen, C. (2017). The situation analysis of shale gas development in China-based on Structural Equation Modeling. *Renewable and Sustainable Energy Reviews*, 67, 1300-1307.

[41] Magano, J., Silva, C. S., Figueiredo, C., Vitória, A., & Nogueira, T. (2021). Project management in engineering education: Providing Gen-Z with transferable skills. *Ieee Revista Iberoamericana De Tecnologias Del Aprendizaje*, 16(1), 45-57.

[42] Mahmoud, A. B., Fuxman, L., Mohr, I., Reisel, W. D., & Grigoriou, N. (2020). “We aren't your reincarnation!” workplace motivation across X, Y and Z generations. *International Journal of Manpower*, 42(1), 193-209.

[43] Maioli, E. (2017). New Generations and Employment â€“An Exploratory Study about Tensions Between the Psycho-social Characteristics of the Generation Z and Expectations and Actions of Organizational Structures Related with Employment (CABA, 2016). *Journal of Business*, 2(1), 01-12.

[44] Manoharan, K., Dissanayake, P., Pathirana, C., Deegahawature, D., & Silva, R. (2024). Assessing the performance and productivity of labour in building construction projects through the application of work-based training practices. *Construction Innovation*, 24(2), 558-583.

[45] Malkanthie A., (2015), Structural Equation Modeling with AMOS, Panadura,Sri Lanka: Nippon Graphics Pvt. Ltd.

[46] Markos, S., & Sridevi, M. S. (2010). Employee engagement: The key to improving performance. *International journal of business and management*, 5(12), 89.

[47] McCarthy, G., & Milner, J. (2013). Managerial coaching: challenges, opportunities and training. *Journal of Management Development*, 32(7), 768-779.

[48] Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological bulletin*, 105(3), 430-445.

[49] Onsongo, E. K., & Schot, J. (2017). Inclusive innovation and rapid sociotechnical transitions: the case of mobile money in Kenya.

[50] Ozorhon, B., & Oral, K. (2017). Drivers of innovation in construction projects. *Journal of construction engineering and management*, 143(4), 04016118.

[51] Pataki-Bittó, F. (2021). Work environment transformation in the post COVID-19 based on work values of the future workforce. *Journal of Corporate Real Estate*, 23(3), 151-169.

[52] Panwar, S., & Mehta, A. (2019). Fostering Leadership in Gen-Z : Onus on Whom?. IUP *Journal of Soft Skills*, 13(3), 65-70.

[53] Pandita, D. (2021). Innovation in talent management practices: creating an innovative employer branding strategy to attract generation Z. *International Journal of Innovation Science*, 14(3/4), 556-569.

[54] Park, J. K., & Lee, K. W. (2022). Efficiency Analysis of Construction Automation Using 3D Geospatial Information. *Sensors and Materials*, 34(1), 415-425.

[55] PMBOK (2021) A guide to the project management body of knowledge, *Project Management Institute*, 7th Ed., Pennsylvania, USA.

[56] Racolţa-Paina, N. D., & Irini, R. D. (2021). Gen-Z in the Workplace through the Lenses of Human Resource Professionals–A Qualitative Study. *Calitatea*, 22(183), 78-85.

[57] Redick, A., Reyna, I., Schaffer, C., & Toomey, D. (2014). Four-factor model for effective project leadership competency. *Journal of Information Technology and Economic Development*, 5(1), 53-68.

[58] Sange, R., & Srivasatava, R. K. (2012). Employee Engagement and Mentoring: An Empirical Study of Sales Professionals. *Synergy* (0973-8819), 10(1).

[59] Schroth, H. (2019). Are you ready for Gen Z in the workplace?. *California Management Review*, 61(3), 5-18.

[60] Shan, M., Li, Y. S., Hwang, B. G., & Chua, J. E. (2021). Productivity metrics and its implementations in construction projects: A case study of Singapore. *Sustainability*, 13(21), 12132.

[61] Shi, D., Lee, T., & Maydeu-Olivares, A. (2019). Understanding the model size effect on SEM fit indices. *Educational and psychological measurement,* 79(2), 310-334.

[62] Shuck, B. & Reio Jr, T. G., (2015). Exploratory factor analysis: implications for theory, research, and practice. *Advances in Developing Human Resources*, 17(1), 12-25.

[63] Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). Using multivariate statistics, *Pearson Education*, 5, 481-498.

[64] Turner, A. (2015). Gen-Z : Technology and social interest. *The journal of individual Psychology*, 71(2), 103-113.

[65] Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, 44(3), 219-246.

[66] Weston, R., & Gore Jr, P. A. (2006). A brief guide to structural equation modeling. *The counseling psychologist*, 34(5), 719-751.

[67] Williams, K. C., & Page, R. A. (2011). Marketing to the generations. *Journal of behavioral studies in business*, 3(1), 37-53.

[68] Wilkinson, A., Johnstone, S., & Townsend, K. (2012). Changing patterns of human resource management in construction. *Construction Management and economics*, 30(7), 507-512.

[69] Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and psychological measurement*, 73(6), 913-934.

[70] Yankov, L., & Kleiner, B. H. (2001). Human resources issues in the construction industry. *Management Research News*, 24(3/4), 101-105.