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ORIGINAL CONTRIBUTION

# Organizational Information Integration and Team Performance: An Inter and Intra Organizational Perspective

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**Abstract—** As construction teams are comprised of multi skilled individuals with varying experiences that are required to work on different projects throughout their career. This research seeks to reconnoiter the role of Information integration in Performance of construction Teams. The United Arab Emirates is protuberant country for construction activities because of considerable investments in mega projects and distinguishing architectural designs. Therefore, survey research is conducted in the United Arab Emirates to understand the relationship of inter-organization information integration and intra-organization information integration of the contracting firms with team performance. The data obtained is then technically analyzed through Structural Equation Modelling (SEM). Results indicates that Inter organization information integration and intra organization information integration have impacts on construction team performance. Based on findings, a model is presented to help improve team performance by understanding the significant role of information integration.The momentous research aid the relation of inter organization information integration and intra organization information integration with team performance thus providing a foundation for new research that can build and strengthen the varying dynamics of Information Integration.Information integration has vivacious standing in expediting operations of construction projects, explicitly improving construction team performance. However, the dynamic nature of the construction industry projects makes it an area of immense need of exploration. The contracting firms that usually work on more than one project can yield better results by improving team performance. Thus, result in improved Firm's performance.

**Index Terms—** : Intra-organization, Inter-organization, Information integration, Team performance, Construction industry

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## Introduction

The construction industry plays a vital role in national economic development. As growth in the construction industry links with infrastructure development, mainly in health and education, this leads to creating more income by engaging multiple types of skilled labor. Researchers are finding ways to improve construction processes with improved technologies and exploring ways to create and communicate the knowledge among participants of construction process (Adekunle et al., 2022). Following the same ideology, one of the research papers provides insights for academicians and practitioners about adopting block chain technology in construction processes (Yanga et al., 2020). Governments also focus on improving the productivity of the construction industry due to its significant contribution to GDP. However, this unusual significance of the construction industry is backed by quite a lot of complex processes. The varying project nature makes it a challenge for joint operations. There are multiple reasons for project failure, yet privations of collaborative information sharing and meager communication are worldwide challenges (Schepper et al., 2014). As construction industry is also comprised of various

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stakeholders Schepper et al. (2014) stress the management of stakeholders and this stakeholder management can be well initiated by integration of information. Figure 1 describes the public involvement of stakeholders in a construction project.

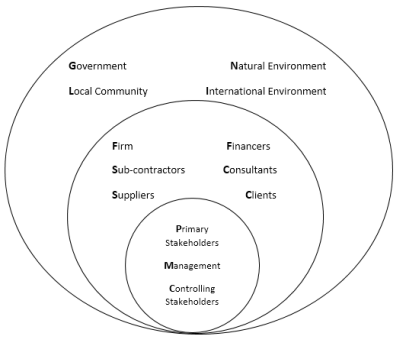


Fig. 1. Stakeholders in general construction project

The high interdependence of the construction supply chain makes it more intricate to manage than other sectors. Figure 2 depicts the progressive level and possible problems that every construction project may deal on general basis. In Supply Chain sharing of information takes place at every level of project progress and at every level of hierarchy. Nevertheless, a lack of apposite information sharing in a significant fraction of project allied activities leads to operational failures. Researchers and project managers also recognize this pressing challenge of the construction industry. Therefore, the need for operative information sharing gains more importance in construction industry due to the fragmentation and discontinuity of project activities. As activities of projects are discrete therefore failure to complete one step will generate delay in other project accomplishments. Moreover, client and contractor often encounter hitches in verifying and validating accurate information mainly related to project deliverable measures of capitals, time, and eminence. These difficulties in time and budget may upshot in client discontent and thus sway national GDP on loftier perspective.

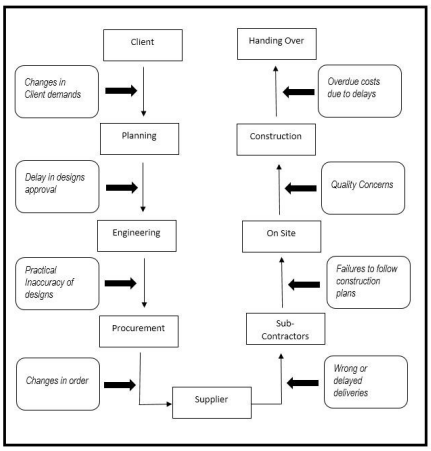


Fig. 2. Interdependence in construction supply chain

Contracting firms based in the United Arab Emirates are selected as the point of investigation for this research paper. Despite Covid-19 economic distress, the construction market of the United Arab Emirates valued at $101.45 billion in 2020 and is expected to reach the predicted value of $133.53 billion by 2026 (Intelligence, 2021). It is a highly competitive market without any dominant players, thus making a progressive construction growth in recent years and provides the world with spectacular designs and record-breaking infrastructures. Due to this high significance, region of the United Arab Emirates is the center of an investigation in this study.

Information is now considered as conventional medium for industrial progress on a global level too and for this, information requires to be well connected for enhanced results. These insights lead to the development of the information integration concept. Information integration is demarcated as combining all dispersed resources of organizational information in order to improve productivity by giving novel meaning (Grant, 1996). The involvement of multiple participants' sources complexities in the construction process, and due to

this, it is even more important to share accurate and timely information among all stakeholders to improve the overall productivity of the construction industry (Wang et al., 2007). Available literature not only focuses on the importance of communication channels among Construction but various models are being presented to improve sharing of information with certain focus on supply chain coordination as well (Nguyen, 2020).

In the 1990s, Researchers first studied the concept of information integration in the construction industry. The first is the presentation of a model based on objects in which all participants are integrated into the design and construction processes (Teicholz & Fischer, 1994). Construction Modeling and Methodologies for Intelligent Integration of Information (COMMIT) is the project that demonstrated the importance of cooperation in managing information for the very first time (Rezqui et al., 1998). Rezqui et al. (1998) believe that only sharing information is not vital for collaboration in engineering projects. Instead, managing information sharing in a way to endorse integration is the actual task. COMMIT addresses issues related to information management. These issues can create hindrances in decision making like unstructured and scatter information cannot provide meaning for new directions. Similarly, the reasons behind certain decisions are not appropriately recorded to support future critical scenarios. In Figure 3, the objectives of commit in providing solutions to problems are summarize.

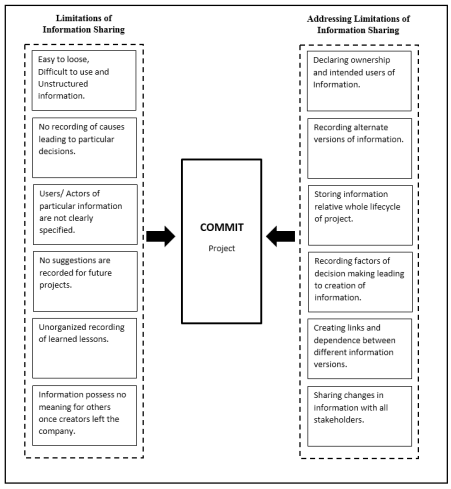


Fig. 3. COMMIT project's problem solving approach

Managing information integration is important as capitalizing information gained from projects and using them in future to avoid repeating mistakes give companies a notable competitive advantage. In today's world of rapid competition companies must need to specify 1% of their revenue to Information Management in order to stay at top of their specific industry (Lush, 2014). Sharing of information within the boundaries of firm along its linkage with outside partners and using this all dispersed information to achieve a common goal is termed as Information integration (Sackey, 2018). And how this information integration impacts with team performance in specific scenario of construction industry is studied in this paper.

To study the varying dimension of information integration and its importance in improving construction team performance following objective will be deliberated:

1. To build knowledge foundations about inter-information integration and intra-organization information integration referring to construction industry.

2. To create a demonstrated model that can explain relationship among information integration dynamics with construction team performance.

## Theoretical Framework

Firms share information for coordination among different functions and with its trading partners through the infrastructure of information sharing that is defined as Information integration (Bajwa, et al., 2008). The implementation of information integration is important for timely exchange information, related to both inter and Intra-organizational business activities (Lai et al., 2008). And lead to augment organization's capabilities to compete in market with operational efficiencies, cost reduction and product quality (Premkumar et al., 2005). Malhotra et al., (2007) while studying adaptive supply chains elucidates that organizations develop electronic linkage for information sharing to deal with complexities of their business and to run smooth operations both for inter-organization and intra-organization functions.

Although information integration is an essential constituent of supply chain coordination (Lee et al., 1997) but it is important to note that external business environment and operating competencies exceedingly affect the ability of firm's information integration in desirable outcomes of performance (Kim et al., 2006). It implies that infrastructure of one particular organization's information integration may not necessarily produce same results in another organization, operating in different industry. For example, management of information integration in health care sector can have different objectives and measures in terms of performance as it may face high uncertainty in external environment. Disasters, war or the spread of epidemic may create a bottleneck in integration infrastructure despite of eminence standards and procedures of information sharing.

**Inter-organization information integration**

Inter-organization information integration denotes the degree to which one firm is electronically connected with partner firms for sharing information (Rai et al., 2006). Rai et al. (2006) suggested that the flow of information related to products, inventory, and finances when supported by engrained IT infrastructure results in improved firm performance. Similarly, the firm's performance in the construction industry depends on the performance of its team working on one or more projects. So inter-organization information integration may vintage some impacts on the performance of construction teams as well.

This information integration renders the organizational goals conceivable by combined efforts in aiding the smooth flow of information, material, and finances (Dehning et al., 2007). Inter-organization information integration improves productivity (Wong et al., 2009) by eliminating wastes through streamlined communication (Stefansson, 2002). In the research conducted by Dainty et al. (2001), it is admitted that the construction industry requires innovations like the manufacturing industry to improve productivity. Larger construction projects include hundreds of companies that supply materials, resources, and construction services. So, outstanding efforts are required in Information integration infrastructure in the construction industry to reduce costs and overhauling charges due to delays.

Unconnected supply chains reason the inefficiencies of the construction industry and adversative practices (Briscoe & Dainty, 2005), and raise the need to maintain information integration infrastructure between consorting firms. It is indispensable in the construction industry as development in the construction sector is measured by the performance of its projects. Furthermore, construction projects are unique with a particular design, cost, time, and expertise requirements; therefore, maintaining and sharing information is critical for these firms to stay competitive and at the top. Similarly, the requisite to partner with supply chain members is crucial due to the vibrant structure of the construction industry, and it implies changing traditional methods of sourcing and coordinating to achieve common goals by sharing information and ensuring mutual sustenance (Wagner et al., 2002). We argue that inter-organization information integration infrastructure in the contracting firm is not an absolute phenomenon; instead has some associations with team performance.

**Intra-organization information integration**

Intra-organization information integration refers to the electronic linkage within the firm that is capable of timely and accurate sharing of information. Individuals and groups do share information within organizations (Zhang & Dawes, 2006) and this information sharing within organizational boundaries improves performance in time management, cost reduction, and better communication among functional departments.

The proficiency of impact produced by information integration depends on IT capabilities within the organization. Development and maintenance of IT infrastructure enhance cross-functional tasks to meet timelines by expediting processes. The absence of Intra-organization information integration causes the incapability of organizational units to develop integrated protocols and solutions to problems (Yang & Maxwell, 2011). Learning from past problems, storing and sharing information for handling future glitches are some of the various recompenses that an organization achieves by maintaining intra-organization information integration infrastructure.

The significance of intra-organization information integration is exorbitant in the construction industry because the requirements of clients from contracting firms vary with each project. These contractual chucks compel organizations to develop a multi-faceted set of skills in architecture, civil engineering, project management, procurement, surveying, etc., and this result in limiting the room for collaboration within construction organizations (Cheng et al., 2001). Intra-organization information integration provides a solution to this problem by creating channels for communication. However, it is not necessary that enabling IT infrastructure will always guarantee sharing of information; instead, group affiliates often do not share scattered information (Cress & Kimmerle, 2006). Other than this various factors influence information sharing among organizational members including, culture, rituals, rewards system, and Information Technology (IT) capability (Yang & Maxwell, 2011). All these factors have interconnected and complex relationships with each other. However, in this paper, focus is on the relation of Intra-organization information integration with construction team performance

### Team performance

A team in the construction industry is a collection of individuals from multiple disciplines whose job is to complete project tasks and provide rational solutions to problems majorly caused by conflicts, high costs, and delays in project completion (Shi et al., 2016). Hasan et al. (2018), while investigating the potency of information technology in construction projects, stated that Team performance is affected by a lack of communication and information sharing from connecting departments. It is a standard practice that the performance of construction teams is usually measured in terms of quality, time management, and operational efficiencies (Leon et al., 2017).

The structure of information integration within the organization has a significant role in determining the performance of construction teams. These teams are combination of people from multi-disciplinary fields, so a lack of effective coordination and sharing of information always remain a challenge for their performance (Huang et al., 2020). Researchers advocate that Interpersonal collaboration within and outside the team also brings critical alteration in construction projects (Wu & Chiu, 2018).

As a result of this, we propose that Information Integration that shares information within the organization and other business organizations has an association with team performance. Thus we hypothesize that:

Ha: Inter-organization information integration and Intra-organization Information Integration are associated with team performance.

As point of detail investigation the association between Inter organization information integration and intra organization information integration is tested, along with this how these two types of information integrations associates with team performance individually is also answered in later part of study.

Hb: Inter-organization information integration is associated with intra-organization information integration.

Hc: Inter-organization information integration is associated with team performance.

Hd: Intra-organization information integration is associated with team performance.

H0: inter-organization information integration and intra-organization information integration are not associated with team performance.

In literature, various studies are found exploring impacts of information integration in organizational success, but how these elements work in the construction industry's dynamic nature requires more attention from researchers. To fill this knowledge gap, we take contracting firms in the construction industry as a point of investigation and find out how Inter-organization information integration and Intra-organization information corresponds with the performance of the construction team.

### Methodology

Despite of changing external business characteristics, information integration results cannot standardize within all firms of same externalities as internal organizational structure also affects information integration infrastructure results. Hence, this empirical research will investigate the association of inter-organization information integration and intra-organization information integration within the vibrant nature of construction industry contracting firm in terms of their relationship with team performance. Measurement items with their definitions and sources are summarize in Table I.

Table I
Constructs definitions and sources

| Construct | Definition | Abbreviation | Sources of Measurement Items |
|---|---|---|---|
| Inter-organization Information Integration | Standardize and digital exchange of business processes information with other firms | Inter | (Wong, Lai, & Cheng, 2012) |
| Intra- Organization Information Integration | Timely and accurately Storing, accessing and exchanging information within the organization with the help of IT infrastructure | Intra | (Wong, Lai, & Cheng, 2012) |
| Team Performance | Extent to which a team meets targets of time, product, quality and efficiencies of coordination and operations | TP | (He, Butler, & King, 2007) |

In order to respond the questions whether inter-organization information integration and intra-organization information integration has any role in improving construction team performance, a multidimensional questionnaire constructed on a 5-point Likert scale from “strongly disagree” to “strongly agree” is used to collect data for analysis.

We aimed to collect most of the responses from higher and middle management professionals, mainly project managers and personnel from the Safety, procurement, planning, and surveying departments. This selection criterion is to get feedback from individuals whose scope of work allowed them to have a holistic view of the information integration process in their organization and its role in the overall

performance of the team. The hypothesis is tested using data collected from the quantitative survey research method. In the initial phase, 72 respondents from medium to large organizations were requested to fill the questionnaire, and we received 48 responses creating a response rate of 66%. The target response rate for social sciences research should be 60% (Fincham, 2008), yet the preference of the journal's editors may impact the acceptable percentage of responses. However, we deleted eight responses as 2 of them were blank, four were incomplete, and the remaining two we deleted, were received late for analysis.

**Data Analysis**

To strengthen the logic of our findings, we tested our Model on Partial Least Square (PLS) model is recommended to estimate the cause-effect relationship between latent and observed variables (Hair et al., 2012). SEM approach is preferably in use for design studies. The application of SEM is also found in research articles focusing on the Construction industry, primarily where the influence or relationship of variables are studied (Liu, Yi, & Wang, 2020). In the paper presented by Liu and his fellows, the SEM approach explore factors that influence the waste reduction concept in the construction industry. Ajayi and Oyedele (2018) and Chen et al. (2012) also used the SEM approach for their model analysis related to the construction industry. Based on the PLS algorithm output, the model is shown in Figure 4.

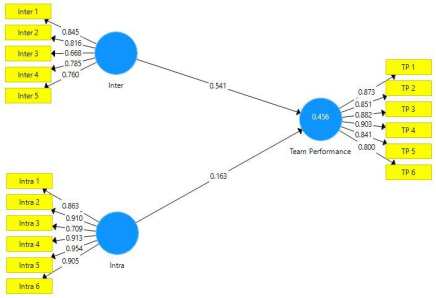


Fig. 4. . PLS algorithm output model

The contributions made by Henseler and Sarstedt (2012) give clear guidelines about SEM applicability for future researches. They used simulated data and compare these values with Structural Equation Modeling based on covariance. The values of outer loadings should be greater than 0.7 to stay in the model (Henseler and Sarstedt, 2012). So, In the first step, adjustments are made after evaluating the measurement model, and then the path model is analyzed (Götz et al., 2010). The insignificance of "Inter 3" roots its deletion from the model. Furthermore, this elimination is crucial as it affects the AVE of the model, as the average of the extreme loads square is equal to AVE; below is the adjusted model with improved factor loading values Figure 5.

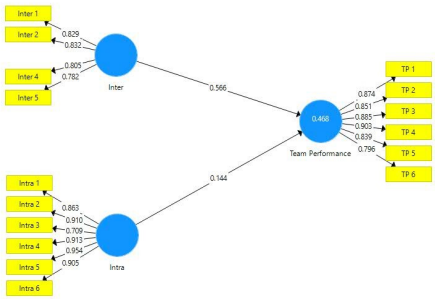


Fig. 5. PLS algorithm output adjusted model for outer loadings

Constructs are discriminant if the value of correlations between them are low enough to disregard the possibility of any correlation (Rönkkö & Cho, 2020). Ronkko and Cho (2020) studied various techniques and definitions, and came up with a recent generalized scope of discriminant validity. Based on this idea discriminant validity test is conducted to reject the possibility of correlation between the constructs.

First, discriminant validity is assessed using Fornell- Larcker Criterion (Fornell & Larcker, 1981). In this technique, square roots of average variance extracted are compared with the latent variable value of correlation. This concept implies that any variable should not explain variance in other constructs instead should describe variance existing in its gages.Table II confirm that constructs used in this model are different and are not overlapping. As the top value in the diagonal is higher than any other value in the same row and column, this is the indication that each construct's square root of AVE is greater than the value of correlations between them.

Table II
Discriminant validity- fornell- larcker criterion

| | Inter | Intra | TP |
|---|---|---|---|
| Inter | 0.812 | | |
| Intra | 0.777 | 0.879 | |
| TP | 0.678 | 0.584 | 0.859 |

In column 1 of Table II Inter←→Inter value of 0.812 is greater than other values of correlations as Intra ←→Inter = 0.777 and TP←→Inter = 0.678. Similarly, in 2nd column Intra←→Intra = 0.879 is greater than any value in the same column and row as Intra←→Inter = 0.777 and TP←→Intra = 0.584. Moving on to the 3rd column TP←→TP = 0.859 is greater than TP←→Inter = 0.678 and TP←→Intra = 0.584 in the same corresponding row.

To further strengthen the results of Discriminant validity we tested our model using HTMT-Smart PLS analysis (Table III). This is a new indicator to confirm that hypothesized relations are real and not just results of statistical discrepancies (Henseler et al., 2015). Henseler et al (2015)., propose that HTMT has ability to attain higher specificity and gives sensitivity rates of 97% to 99%. HTMT values less than 0.90 confirms the formation of discriminant validity while values above 1 shows the lack of discriminant validity (Gold et al., 2001). Using this criterion, we refer that our Path Model developed in SAMRT PLS, all constructs are different from each other (Hair et al., 2019). As per Table III all values Intra←→Inter = 0.888, TP←→Inter = 0.753 and TP←→Intra = 0.611 are less then threshold of 0.90. Thus our model does not have any issue related to collinearity.

Table III
Heterotrait-monotrait ratio of correlations (HTMT)

| | Inter | Intra TP |
|---|---|---|
| Inter | | |
| Intra | 0.888 | |
| TP | 0.753 | 0.611 |

When the model is analyzed by discerning convergent validities obtained by the Average Variance Extracted (AVE), our model fulfilled the Fornell and Larcker Criteria of values greater than 0.50 as AVE (inter)= 0.66, AVE (intra)= 0.773, and AVE (TP)= 0.738, shown in Table IV. We confirm that our model has satisfactory convergence results (Fornell and Larcker, 1981). On the other hand, the value of AVE<0.50 means that items explain more errors in the model than the variance in constructs.

Cronbach's Alpha (α) is recommended to test the internal reliability of items, especially in the likert scale questionnaire, to ensure that all questions used in the likert scale survey questionnaire give reliable results and measure the intended particular variable. As a rule of thumb, α ≥ 0.70 is good, α ≥ 0.80 is better, and α ≥ 0.90 is considered best. Thus we can regard Inter-organization information integration α as better (inter α=0.829) and both Intra-organization information integration α (intra α = 0.94) and Team Performance α (TP α = 0.929) as best. In Table IV, Composite reliability reaffirms the quality of reliability in our proposed model as it ranks variables based on their reliabilities, composite reliability (CR) values > 0.70 are satisfied indicators (Hair et al., 2014).

Table IV
Construct reliability and validity

| | Average Variance Extracted (AVE) | Cronbach's Alpha | Composite Reliability | RHO_A |
|---|---|---|---|---|
| Inter | 0.66 | 0.829 | 0.886 | 0.836 |
| Intra | 0.773 | 0.94 | 0.953 | 0.953 |
| TP | 0.738 | 0.929 | 0.944 | 0.941 |

With SEM, we measured composite reliability as it is the accurate measure of reliability (Peterson & Kim, 2013). Raykov (2001) explains the benefits of SEM and regard estimation of true reliability as one worth mentioning attribute. The reason for this accurate measure of reliability in the form of composite reliability is the freedom to vary the loadings of constructs, which in the case of Cronbach's Alpha is restricted to equal. Values of composite reliability shown in Table IV indicate that all measurement questions have higher integral

consistency as Composite reliability values for inter = 0.886, intra = 0.953, and TP = 0.944 are all greater than the minimum threshold of 0.6.

The reliability of our model is further confirmed by the value of rho_A, which is another version of composite reliability. The only difference between rho_A and composite reliability is the method through which reliability is measured. Rho_A measures the model's reliability on unstandardized values, while composite reliability uses standardized values for measuring reliability. In recent literature, recommended value of rho_A > 0.7 is presented to confirm the reliability of the model (Pham, 2020). As shown in Table IV. rho_A Inter = 0.836 > 0.7, rho_A Intra = 0.953 > 0.7 and rho_A TP = 0.941 > 0.7.

Linear regression in SPSS is implemented to confirm PLS results as *R*-value represents the tendency of the model through predicting the power of independent variables to describe the dependent variable. *R*=0 shows lack of linear correlation between dependent and independent variables, and *R*=1 represents the perfect predictions of the model. Referring to Table V, the value of *R* = 0.738 represents a strong positive correlation between dependent and independent variables.

$R^2$= 0.545 depicts that Inter-Organization information integration and Intra-Organization information integration can bring 54.5% variance in team performance. It is required to consider the $R^2$ values for the model's goodness of fit. There is a small difference between the observed and predicted values if a model fits the data. The value of $R^2$ is between 0% to 100%. However, the minimum threshold of $R^2$ depends on the field of study like in pure sciences $R^2 \geq 0.60$ is required, while $R^2$ as low as 0.10 is acceptable in arts, humanities, and social sciences. As per Cohen (1992), $R^2 \leq 0.12$ is low, $0.13 \leq R^2 \leq 0.25$ is medium, and $R^2 \geq 0.26$ is symbolized as an indication of high effects.

The adjusted $R^2$ value of 52.1% indicates how reliable the correlation is between dependent and independent variables in our model, which is an acceptable range for social sciences research. Standard error of estimates gives the possibility of wrong predictions using the presented model, which is 0.07074. Thus, there is only a 7.07% chance of error when prediction about team performance is made using this model. It is the average distance of observed values from the regression line. The lesser the distance, the more chances for the sample mean to represent the actual population accurately.

Smart PLS generates another measure of the model's goodness of fit, i.e., Standardized Root Mean Squared Residual (SRMR) - Table V. It is a technique used to access the goodness of fit for models based on SEM (Pavlov et al., 2021). Pavlov et al. (2021) examined the value of p in a simulation study by using mean and variance adjustment of the distribution of SRMR. Moreover, it finds out that the approximation of SRMR is entirely accurate to explain the goodness of fit. We refer to our model value of 0.078, which is less than the threshold of 0.08 and thus represents a good fit of the model (Hu & Bentler, 1999).

Table V
Model fit statistics

| *R* | $R^2$ | Adjusted $R^2$ | Std. Error of the Estimate | SRMR |
|---|---|---|---|---|
| 0.738 | 0.545 | 0.521 | 0.07074 | 0.078 |

Furthermore, the statistical significance of regression analysis Table VI suggests that the model is a good fit of data with *F*>0, i.e., 22.185. the *F* test compares the model containing predictor variables with a model containing no predicting variables. The addition of variables in the model increases the *F* value, thus increasing the possibility of rejecting the null hypothesis, i.e., inter-organization information integration and intra-organization information integration are not associated with team performance. Nevertheless, for total assessment value of *F* needs to be related to the *p*-value as well. In the presented model significant value *p*<.001, which is too less than the threshold of *p*<0.05, thus represents a high level of significance.

Table VI
ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | .222 | 2 | .111 | 22.185 | <.001 |
| Residual | .185 | 37 | .005 | | |
| Total | .407 | 39 | | | |

The sum of squares explains the deviation of observed values from the mean value. As observed values deviate from the regression line, the sum of squares also increases, indicating more data dispersion. As of Table VI, out of the total variability of the model, i.e., 0.407, 0.222 is explained by constructs observations, while residual variability of 0.185 is termed unexplained variability.

### Correlation analysis

As point of study we find out how team performance of construction teams are affected by Inter organization information integration and Intra organization information integration. Yet we are also interested in knowing that how these two types of information integration relate with which each other and with team performance individually. Correlation analysis in SPSS is used to evaluate the association between 1. Inter organization information integration and Intra organization information integration

2. Inter organization information integration and team performance

3. Intra organization information integration and team performance

As per Table VII, the correlation between Inter organization information integration and Intra organization information integration is significant as value of $p$ <0.05 thus accepting H. Pearson correlation value ranges from -1 to +1 in which -1 indicates a perfect negative association and +1 indicates perfect positive association. While correlation value equals to zero reflects no association between variables. So Pearson correlation value of .854 indicates a strong positive association between inter organization information integration and intra organization information integration leading to the elucidation that increase in inter organization information integration will render increase in intra organization information integration and vice versa. The association between variables is further explained by R2 that is solely square of Pearson correlation coefficient.

$R^2$ Inter-- Intra = (.854)2

$R^2$ Inter-- Intra = 0.729

$R^2$ Inter-- Intra =73%

So, inter organization information integration explains 73% change in Intra organization information integration in contracting company operating within construction industry.

Table VII
Correlation analysis between Inter organization information integration (inter) and intra organization information integration (intra)

| | Correlations | Inter | Intra |
|---|---|---|---|
| INTER | Pearson Correlation | 1 | .854** |
| | Sig. (2-tailed) | | 0.000 |
| | N | 40 | 40 |
| INTRA | Pearson Correlation | .854** | 1 |
| | Sig. (2-tailed) | 0.000 | |
| | N | 40 | 40 |

As correlation value between 0.3 and 0.7 reflects moderate association and greater than 0.7 regarded as strong association. In Table VIII, Pearson correlation value of .738 with $p$<0.05 reflects a strong positive correlation between Inter organization information integration and team performance. Similarly Inter organization information integration can be cause of 54.4% change in construction team performance. $R^2$ Inter-- TP = (.738)2

$R^2$ Inter-- TP = 0.544

$R^2$ Inter-- TP = 54.4%

Table VIII
Correlation analysis between Inter organization information integration (inter) and team performance (TP)

| | Correlations | Iinter | TP |
|---|---|---|---|
| INTER | Pearson Correlation | 1 | .738** |
| | Sig. (2-tailed) | | 0.000 |
| | N | 40 | 40 |
| TP | Pearson Correlation | .738** | 1 |
| | Sig. (2-tailed) | 0.000 | |
| | N | 40 | 40 |

Table IX, describes the statistical value of moderate positive correlation between Intra organization information integration and team performance with pearson value of .647 as 0.3 < 0.647 < 0.7. Intra organization information integration is responsible for 42% change in construction team performance.

$R^2$ Intra-- TP = (.647)2

$R^2$ Intra-- TP = 0.418

$R^2$ Intra-- TP = 42%

Table IX
Correlation analysis between Intra organization information integration (intra) and team performance

| | Correlations | Intra | TP |
|---|---|---|---|
| INTRA | Pearson Correlation | 1 | .647** |
| | Sig. (2-tailed) | | 0.000 |
| | N | 40 | 40 |
| TP | Pearson Correlation | .647** | 1 |
| | Sig. (2-tailed) | 0.000 | |
| | N | 40 | 40 |

Table X
Hypothesis testing results

| Hyp. | Statement | Results |
|---|---|---|
| Ha | Inter-Organization information integration and Intra-Organization Information Integration are associated with Team Performance. | Supported |
| Hb | Inter-Organization Information Integration is associated with Intra-Organization Information Integration. | Supported |
| Hc | Inter-Organization information integration is associated with Team Performance. | Supported |
| Hd | Intra-Organization Information Integration is associated with Team Performance | Supported |
| H0 | Inter-Organization information integration and Intra-Organization Information Integration are not associated with Team Performance | Not Supported |

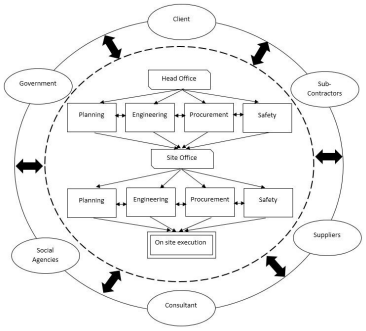


Fig. 6. Inter organization information flow and intra organization information flow

## Conclusion

A contracting firm in the construction industry must communicate internally within its boundaries and with more than one organization externally. Internal communication could be cross-functional and between head office and site office generally. In contrast, the external entities could be consultants, sub-contractors, suppliers, clients, social or governmental bodies. Figure 6 describes the network of information flow for contracting firms. Both types of information flow result in an impact on team performance.

A continuous stream of communications within and between the organizations occurs at all levels of the project, as information flow is not a one-time activity. The internal communication can be between two different functional groups, and it could be among different managerial levels from strategic to operational hierarchy and vice versa. At the same time, the contracting company is communicating with outside partners, which can be suppliers, consultants, or any other entity that could impact the performance of the team. Figure 7 shows the conceptual model that will help practitioners effectively communicate and manage information to improve the performance of teams.

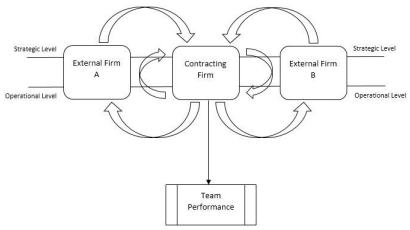


Fig. 7. Conceptual model for improving team performance

Furthermore, as the literature suggests that the need for information sharing and operational coordination is very high in the construction industry; our results imply that sharing information within the contracting firm and with its outside business partners renders significant change in the performance of construction teams. From the practical perspective, this idea is also supported as the product of the construction industry is not always similar. Construction companies work on project-based operations. There can be some or complete change in design, planning, architecture, material sourcing, or even the expertise involved in every project. For a single project planning, there is more than one entity involved in determining the specifications of the output project. Lack of coordination among partnering members can result in delays, higher costs, inventory stock-outs, wastage generation, and client dissatisfaction. So for industries with dispersed and project nature operations, the infrastructure of information integration renders a significant role in team performance and needs to retain a significant amount of time and finance.

**Limitations and Future Recommendations**

Researchers are encouraged to duplicate the findings of this study in different sector to explore the validity of the findings. The project based nature of construction industry may emphasize more on Integration of knowledge among organizational boundaries yet the relative significance of the subject nature in different industrial pattern can lead to more different perspectives of team performance measurement patterns. It is also recommended to test model on different parameters other than what presented in this research study so that the findings of the research could be validated on multiple statistical grounds. There can also be various other determinants of improving performance of team performance including organizational structure, reward systems, training and development that can also be included in future investigations of project performance indicators.

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