

Trust eccentricity and commonality in the transaction of construction digital information

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Abstract: Computing technology has changed the way construction parties produce and transact the project's information. In this regard, converting physical information to digital forms for electronic transferal is perceived as a notarize way in exchanging crucial project's information. Known as digitization, it explains the economic and social transformation of the industry triggered by the digital technology in the wake of the Industrial Revolution 4.0 (IR 4.0). Like any other modes of electronic transferal, transacting project's digital information to myriad construction parties is not without setbacks. Data suppression, quality reduction, obliteration and trust issues have brought some negative influences on the information passed around a project's circle. Though there are a fair amount of studies being carried out to investigate on issues concerning digital information in a construction environment, it appears to predominantly cover on the characters, integrity and the state of information as opposed to the trust among parties which is needed to trigger the process of information transferal. This leaves a gap in the on-going discussion on the transferal of digital information and necessitate a study to be carried out. Hence, this study aims to explore the significant issues of trust in the transaction of digital information focusing on contractors and quantity surveyors. The study outlined two objectives which are: (1) To determine the significant trust issues as perceived by contractors and quantity surveyors; and (2) To determine the significant differences in trust issues as perceived by contractors and quantity surveyors. Quantitative research design was adapted to conduct the study. For this purpose, a questionnaire was designed based on critical studies of related pieces of literature and distributed among two respective sample groups of contractors and quantity surveyors. Data from the questionnaire was subjected to Cronbach's alpha reliability test and normality test. Subsequently, descriptive analyses and the Mann-Whitney U test were performed to determine the significant differences between contractors and quantity surveyors in conformance to the objectives of the study. Findings from this study offered a connection between the less-distinctive issues of trust in the transferal of digital information which is one of the backbones in the pursuit of IR 4.0.

Key words: Digital Information; Digitization; Industrial Revolution 4.0; Quantity Surveyors; Trust.

1. INTRODUCTION

There has been a long standing industry wide perception that the construction industry is underperforming due to the industry's characteristics (Ozorhon, Oral, & Demirkesen, 2015; Yusof, 2017). While the impacts from some of these characteristics are resulted by the complex interaction of the external environment, the fragmented character of the construction industry appears unique and inimitable from the other industries (Fadhlin, 1999). For this reason, researchers across the industry had unanimously agreed, that an improved construction performance could be achieved by streamlining and coordinating project's information (Atkin, 1995; Shamsulhadi, 2015).

The recent decades have seen an incursion of technologies that changed the way construction parties produce and transact project's information. Construction parties are no longer depend on physical transferal of information but have found a cheaper and faster digital alternative to get information across. In this regard, converting physical information to digital forms for electronic transferal is perceived as a notarize way in exchanging crucial project's information (Khan, Khan, & Aftab, 2015; Martínez-Rojas, Marín, & Vila, 2016). Known as digitization, it explains the economic and social transformation of the industry triggered by the digital technology in the wake of the Industrial Revolution 4.0 (IR 4.0) (Khan et al., 2015).

Like any other modes of electronic transferal, transacting project's information digitally to myriad construction parties is not without setbacks. Data suppression, quality reduction, obliteration and trust issues have brought some negative influences to the information passed around a project's circle (Duranti & Rogers, 2012). Though there are a fair amount of studies being carried out to investigate on issues concerning digital information in a construction environment, it appears to predominantly cover on the characters, integrity and the state of information as opposed to the trust among parties which is needed to trigger the process of information transferal (Aldossary & Allen, 2016; Gad & Shane, 2014; Leviäkangas, Mok Paik, & Moon, 2017). This leaves a gap in the on-going discussion on the transferal of digital information and necessitate a study to be carried out.

The aim of the study reported in this paper was to explore the significant issues of trust in the transaction of digital information focusing on contractors and quantity surveyors. The study outlined two objectives which are: (1) To determine

the significant trust issues as perceived by contractors and quantity surveyors; and (2) To determine the significant differences in trust issues as perceived by contractors and quantity surveyors. The findings are significant to increase the dearth of literature and offer a connection between the less-distinctive issues of trust in the transferal of digital information which is one of the backbones in the pursuit of IR 4.0.

This paper starts by presenting a review outcome from the critical studies of literature concerning trust in the digital environment. It results into a theoretical framework which outlines the distinct trust issues and the methods to overcome. Next, the methodology for the study is presented which contains the strategy for data collection and analysis. The papers ends by reinstating the thoughts which have culminated the proposal and the significance contribution that the study will bring in the current discussion of trust, particularly in the construction's digital environment.

2. REVIEW ON TRUST ISSUES IN THE TRANSACTION OF CONSTRUCTION'S DIGITAL INFORMATION

2.1 Trust in the Digital Environment

Digitization is the latest technological trend in all levels of society in the wake of the Industrial Revolution 4.0 (IR 4.0) (Liu et al., 2017). It has invoked an influx of computing technologies which has changed the way construction parties produced and transacted project's information (Saima Khan, 2015). Malhan (2009) explained that the development of computer technologies has offered new means in information delivery. It has accelerated the process of information digitization which transforms physical information into digital forms (Islam, 2011). Hence, project's information exchange has found a new alternative which is considered easier and faster than before.

Digital environments can be viewed as a platform that enable the transactions, collaborations, service delivery and information exchange to take place (Pranata, Skinner, & Athauda, 2012). It enables timely production and dissemination of information, which helps to reduce delay especially where time become a premium. Converting any kinds of data to digital forms somehow contains setback. Data suppression, quality reduction, obliteration and trust issue are among the major hindrance in the process (Duranti & Rogers, 2012). Besides, a breach of trust may creep in somewhere along the process to transfer the digital information (Oliver, Chawner, & Liu, 2011). Thus, this affects the decision to digitise important information along the project's cycle especially when information privacy has become one of the dominant issue today (Ziegeldorf, Morchon, & Wehrle, 2014).

Trust as a concept include will, expect, belief, outcome and attitude (Castelfranchi & Falcone, 2010). These are the most frequently used terms in describing trust though it contingent upon a party able to secure willingness from a trustee. A trustee who accedes the 'willingness' is exposed and vulnerable to the action of to the other party who is now a trustor. In most instances, a trustee will perform a particular action to monitor or control the trustor especially in matters concerning privacy (Kramer, 2006).

In the context of digital environment, Labib et al. (2018) defined digital trust as "the confidence placed in an organization to collect, store, and use the digital information of others in a manner that benefits and protects those to whom the information pertains". They identified four elements to digital trust which are accountability, security, privacy and consumer benefit and value. With the increased complexity, connectivity of current ICT systems, the data volume and the diversity involved, trust has become a keystone, notably to ensure robustness and information security of the related systems (Rasim Alguliyev, Yadigar Imamverdiyev, & Lyudmila Sukhostat, 2018; Oliver et al., 2011).

2.2 Trust Issues in the Digital Environment

Issues of trust in the digital environment are hard to be secluded or isolated. It is frequently bound with all the more effectively recognized issues of protection, security, and jurisdiction (Duranti & Rogers, 2012). Another issue with trust in the digital environment is the difficulty to evaluate the exact trustworthiness value of an entity. This is even harder when each entity has a different interpretation and perception of the term "trustworthy" (Pranata et al., 2012).

Furthermore, trust is a highly complicated and multi-dimensional concept. Trust is also a central variable associated with information privacy and an important factor that relates to social networking adoption and information-sharing behaviour. In the aspect of privacy and security, Privacy and security are complex processes with different meanings depending on the application. The key concepts in privacy and security are confidentiality, integrity, entity authentication and non-repudiation (Black & Layton, 2014).

In a short, trust issues in transferring digital information include confidentiality, integrity, entity authentication, personal behaviour, accountability and cyber security which will be further discussed in the following sections.

2.2.1 Confidentiality

In the concept of confidentiality, Black and Layton (2014) explained that private information and data should not be allowed to be shared, exposed and to be made public to unauthorised parties. Rasim Alguliyev, Yadigar Imamverdiyev, and Lyudmila Sukhostat (2018) mentioned that information security is the preservation of confidentiality and availability of information. Sicari, Rizzardi, Grieco, and Coen-Porisini (2015) also viewed that issues of trust which are critical for the digital environment (IoT environment) are characterized by different devices which have to process and handle the data in compliance with user needs and rights to prevent the information from be published to the third party without permission. Aldossary and Allen (2016) also mentioned that the data stored in the digital technologies such as cloud need to be made

confidential, in order to preserve the integrity and its availability. There is a tendency in the literature to positively associate networking and digital technology to trust expectation. Hence, confidentiality improves trust and enable parties to transact in a trustworthy manner.

2.2.2 Integrity

Issues of trust in the aspect of integrity can be explained as the property of accuracy and completeness. It means that digital information must be complete, accurate and should not be modified by unauthorised parties (Black & Layton, 2014). According to Liu et al. (2017), digital technology such as cloud servers cannot be fully trusted. This is due to the fact that data loss could happen, where the cloud servers might not inform users immediately to maintain a good reputation and avoid from shouldering the responsibility. Furthermore, according to Duranti (2012), trust issues occurred when customers need to trust that their data is being protected and managed securely. According to Gad and Shane (2014), the construction industry, client are acquiring information from the record. So, the concept integrity has the highest influence of trust-building.

2.2.3 Entity Authentication

Entity authentication is a process which allows the identity of an individual or organisation to be verified (Aldossary & Allen, 2016). The term authentication refers to an electronic process that allows for the electronic identification of a natural or legal person. Additionally, authentication may also confirm the origin and integrity of data in electronic form, such as the issuance of a digital certificate to attest to the authenticity of a website (Turner, 2016). According to Duranti (2012) digital environment has allowed for the uncontrolled growth of information and database that can be accessed from any time and any location which has led to the trust issues to occur. Thus, information security issues such as authentication, encryption, and privacy protection are the popular focuses of researches (Dominic, Ahmad, & Ab. Aziz, 2013). Issues of trust can occur due to non-authentication of the digital information and digital technology.

2.2.4 Personal Behaviour

Trust issues also occur when a huge number of entities mutually collaborates and interact with each other to provide, transfer, sharing and consume the information or resources (Pranata et al., 2012). The digital technologies make the digital information easy to transfer and shared to the third parties. Personal behaviour that compel personnel to share information to the third parties has led to the trust issues. According to Gollins (2009) the issues of scale and speed transfer and transferal of digital information are the challenges of digital preservation.

2.2.5 Accountability

In the aspect of accountability, companies must be accountable for the protection of consumers' digital information. Companies should establish a transparent model that specifies what and how data is sourced and from whom. Monitoring what data are accessed, when and by whom is a critical aspect of maintaining trust. Furthermore, companies are accountable for misuse of and incorrect information about customers and they must promptly take corrective actions (*White Paper Digital Trust for Smart ICT*, 2016). For example, the data storage in the cloud must be accessible by the client when the client need it (Duranti & Rogers, 2012). Hence, issues of trust occur when a transparent model to transact information is not sufficiently established.

2.2.6 Cyber Security

In aspect of low protection of cyber security, any businesses that connected to the internet included construction industry have the potential to become the victims of the Cyber-related crime incidents. Hackers may want to gain access to the system to steal or access to proprietary corporate assets and digital information, including privileged contracts, data, architectural designs and intellectual property. Besides that, hacker also attempt to entice an employee to accidentally to transfer corporate assets such as digital information (Montera, 2016). In addition, digital information can be defined that can be connected to the internet had increase the additional intrinsic value the cybercriminal (Hunton, 2012). Digital information that transfer through network communication can also lead to individual, organization and governments exposed to the risks and threats of cybercriminal. Thus, cyber security is one of the aspects of trust issues.

3. RESEARCH METHODOLOGY

3.1 Sampling and Data Collection

A purposive non-random sampling technique was carried out to identify a suitable two groups of samples for the study. According to Sekaran and Bougie (2010), a purposive non-random sampling technique, despite it's limitation for generalisation, provides a quick and less expensive method to gather data before a much more thorough study is conducted. This study in particular wishes not to generalise the findings, but seeks to provide an indication of the present state of trust between contractors and quantity surveyors for a much deeper, multi variables study to be carried out. As such, a non-random sampling technique was mooted as appropriate, with focus directed to gather as many responses as possible between the two samples group concerned.

Data collection through questionnaire survey was carried out, focusing on quantity surveyors and contractors in Johor Bahru and Kuala Lumpur. This accords to the locality of where the researchers are residing and the number of firms available in

both areas. A list of all available firms in both places was established for contractors and quantity surveyors via databases held by CIDB and the Board of Quantity Surveyors Malaysia (BQSM) respectively. Questionnaires were distributed through hand delivery, email and online survey tools and passed around through the addresses readily available through the databases. To increase the response to the survey, questionnaires were passed to students undergoing their practical training. This helps to provide extra visibility to the survey beyond the means available to the researchers. Data collection period was scheduled for two months where effort to boost response was constantly made and conducted.

3.2 Data Analysis Method

Quantitative research design was adopted for this study. According to Fellows and Liu (2008), quantitative research involved the collection of data to measure the reality to achieve a result. Quantitative research can identify responses to relational questions of variables involve in this study. In view of this, a questionnaire was designed based on critical studies of related pieces of literature with the variables included were shown in the theoretical framework presented in Figure 1.

A correlational analysis method was used to analyse data obtained from the survey. The analysis method sought to examine the differences between the characteristics of the two study groups. As stated in Section 3.1, questionnaires were distributed to two respective sample groups of contractors and quantity surveyors. This provides the data for the correlational analysis to be carried out. Before the questionnaires were administered to the prospective sample groups, it was important to figure out the statistical correlation between the two classes of variables involved in the study. For this reason, a pilot study was carried out with a small sample groups of contractors and quantity surveyors. The pilot study sought to establish how well the classes of variables correlate through the Cronbach's Alpha reliability test. As high degree of reliability is important components that will affect the correlation coefficients, it is therefore imperative that the pilot sample groups mimic the actual samples whom the questionnaires will be administered.

Data gathered from the questionnaire was coded using SPSS as the analytical tool. Data was checked for missing values and reduce in preparation for the correlational analysis to be carried out. Next, the normality test was carried out. For this purpose, histograms were used to interpret the normality of the data which is crucial in order to determine a selection between parametric and non-parametric correlational analysis. By inspecting the shape of the histograms, a quick summary of the distribution of the score on the continuous variables could be derived which is prerogative in deciding whether data distribution is normally distributed or otherwise. The result of the normality test suggested that data gathered for the study was not normally distributed. Accordingly, the non-parametric Mann-Whitney U test was employed for the correlational analysis.

Summary of the correlational analysis through the non-parametric Mann-Whitney U test can identify whether there is a statistically significant differences in the means score between the two groups which will provide enough information to achieve the study's aim.

4. DATA ANALYSIS AND FINDINGS

4.1 Response to the Questionnaire Survey

A total of 140 sets of questionnaires were distributed through email, online survey tool and by hand equally to 70 quantity surveying firms and 70 contracting organisations. As the study had intended to seek opinion related to the significant trust issues and the ways to overcome the trust issues between two different classes of sample group, the professional background of the samples who responded to the survey from the contracting organisations were not of particular interest. The study posited that irrespective of the background of the samples from the contracting organisations, emphasised was to be directed towards their views on trust in a contracting environment, rather than the manner which their professional background ought to influence their opinion on trust. Deliberately, this has allowed greater participation with focus was able to be directed on the responses instead of who the samples are in the contracting organisations.

Out of 140 survey questionnaires distributed, 68 questionnaires were returned and analysed. This constitute of 48.57% with the distribution is as shown in Table 1.

Table 1: Responses and demographic information of the returned questionnaire

| Demographic characteristics | | Quantity surveyors | Contractors | Total | Percentage (%) |
|-----------------------------|-------------------|--------------------|-------------|-------|----------------|
| | | n | n | | |
| | | | 38 | 30 | 68 |
| Gender | Male | 18 | 13 | 31 | 45.59 |
| | Female | 20 | 17 | 37 | 54.41 |
| Age | 21-25 | 13 | 5 | 18 | 26.47 |
| | 26-30 | 13 | 13 | 26 | 38.24 |
| | 31-35 | 3 | 4 | 7 | 10.29 |
| | 36-40 | 2 | 5 | 7 | 10.29 |
| | 41-45 | 3 | 1 | 4 | 5.88 |
| | 46-50 | 2 | 0 | 2 | 2.94 |
| | 51-55 | 0 | 1 | 1 | 1.47 |
| | Unknown | 2 | 1 | 3 | 4.41 |
| Working Experience | Less than 5 years | 26 | 20 | 46 | 67.65 |
| | 6 - 10 years | 3 | 3 | 6 | 8.82 |
| | 11 - 15 years | 3 | 2 | 5 | 7.35 |
| | 15- 20 years | 3 | 4 | 7 | 10.29 |
| | More than 20 | 3 | 1 | 4 | 5.88 |

Source: Field survey, 2019.

4.2 Mean Analysis

As a precursor to the correlational analysis, the mean analysis was performed to observe the general characteristics of the data gathered from the survey. The aim of the mean analysis was two-folded: (1) to identify the significant issues of trust between the quantity surveyors and contractors; and (2) to identify whether there are noticeable differences in the opinion between the quantity surveyors and contractors on the issues of trust which would validly warrant a statistical differences to be determined. Results from the mean analysis are presented in the following sections.

4.2.1 The Significant Trust Issues between Quantity Surveyors and Contractors

Table 2 and Figure 1 indicate the result from the survey on the significant trust issues between two independent groups of quantity surveyors and contractors. The results show that *confidentiality* with the highest mean of 4.20 is ranked first, followed by *cyber security* ($\bar{x} = 4.17$). The result also shows that *accountability* with a mean of 4.12 and *integrity* ($\bar{x} = 4.07$) both fall respectively in the third and fourth rank. Next, *entity authentication* has scored 3.54 making it in the fifth rank while *personal behaviour* is the last with a mean of 3.33.

The data analysis further suggests that quantity surveyors viewed *confidentiality*, *cyber security*, *accountability* and *integrity* as the most significant issues of trust while *entity authentication* and *personal behaviour* are considered as the moderately significant trust issues in the transaction of construction digital information. The data thus suggests that quantity surveyors had viewed *confidentiality* ($\bar{x} = 4.20$) as the most significant issues of trust in transferral of digital information while *personal behaviour* ($\bar{x} = 3.33$) is considered as the least.

To the contractor, the results show that *integrity* with the highest mean of 4.50 is ranked first, followed by *confidentiality* ($\bar{x} = 4.42$). The result also shows that *cyber security*, *accountability* and *entity authentication*, have scored 4.33, 4.27 and 3.95 respectively which have made these issues in the third, fourth and fifth rank. The bar chart also shows that *personal behaviour* is the last with a mean of 3.42.

The data analysis further suggests that contractors viewed *integrity* ($\bar{x} = 4.50$), *confidentiality* ($\bar{x} = 4.42$), *cyber security* ($\bar{x} = 4.33$), *accountability* ($\bar{x} = 4.27$) and *entity authentication* ($\bar{x} = 3.95$) as the most significant issues of trust while *personal behaviour* ($\bar{x} = 3.42$) is considered as the least.

The result from the mean analysis has provided a general overview on the manner which the samples of two independent groups of quantity surveyors and contractors observed the issues of trust in transacting digital information. In this instance, both independent groups of quantity surveyors and contractors regard the issues are in the higher region of significant ($\bar{x} = 3.33 \sim 4.50$) which suggests that trust issues are present in their accord to transact digital information.

Despite the believed that trust issues exist, it is observed however that the means are considerably varies across the issues of trust between the quantity surveyors and contractors. In this regard, there are noticeable differences in the opinion between the quantity surveyors and contractors on the issues of trust which warrant a statistical difference to be determined. The following section examines the differences in detail by determining the significant differences between quantity surveyors and contractors.

Table 2: The significant trust issues between quantity surveyors and contractor

| Rank of Trust Issues | QS | Rank of Trust Issues | Contractor |
|---------------------------|------|---------------------------|------------|
| Most significant | | | |
| Confidentiality (1) | 4.20 | Integrity (1) | 4.50 |
| Cyber Security (2) | 4.17 | Confidentiality (2) | 4.42 |
| Accountability (3) | 4.12 | Cyber Security (3) | 4.33 |
| Integrity (4) | 4.07 | Accountability (4) | 4.27 |
| Moderately significant | | Entity Authentication (5) | 3.95 |
| Entity Authentication (5) | 3.54 | Moderately significant | |
| Personal Behaviour (6) | 3.33 | Personal Behaviour (6) | 3.42 |

Source: Field survey, 2019.

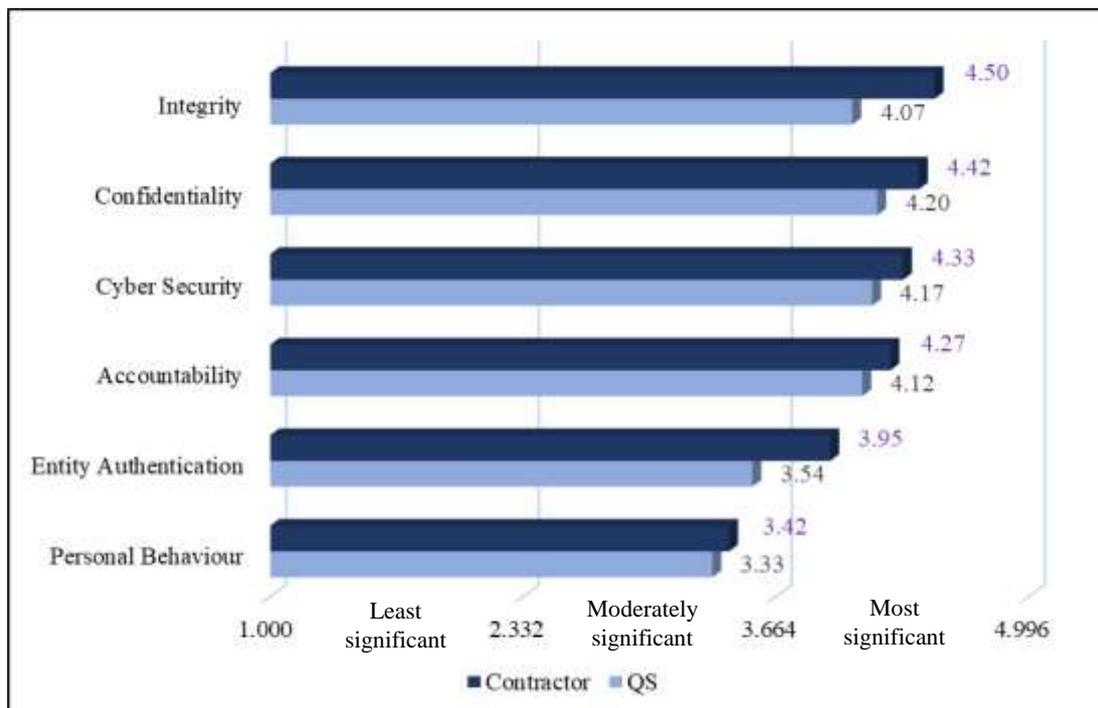


Figure 1: Mean comparison on the significant trust issues between quantity surveyors and contractor

4.2 The Significant Differences with Trust Issues between Quantity Surveyors and Contractors

The Mann-Whitney U Test was carried out to determine the significant differences between quantity surveyors and contractors. Table 3 shows the result from the test that was carried out. Regarding confidentiality, the result shows $P = .15$, which is $P > 0.05$, therefore there is no significant different in the change of the mean score between quantity surveyors and contractors. The same was also observed with issues related to Cyber security ($P = .29 > 0.05$); Accountability ($P = .37 > 0.05$); Entity Authentication ($P = .07 > 0.05$) and Personal behaviour ($P = .62 > 0.05$) where the $P > 0.05$ and therefore there is no significant differences in the change of the mean score between quantity surveyors and contractors. Despite, for issue

related to integrity $P < 0.05$ where $P = .02$. The result thus indicates that there is significant difference between quantity surveyors and contractors on their view on integrity.

Table 3: Test statistics

The significant differences on the trust issues between quantity surveyors and contractor

| Trust issues | Result of Mann-Whitney U test | Significant differences (Sig. Diff.) |
|-----------------------|------------------------------------|--------------------------------------|
| | Asymp. Sig. (2-tailed) <i>P</i> | |
| Integrity | .02* | Significant** |
| Confidentiality | .15 | Not significant |
| Cyber security | .29 | Not significant |
| Accountability | .37 | Not significant |
| Entity Authentication | .07 | Not significant |
| Personal behaviour | .62 | Not significant |

*Note: If P value (Asymp. Sig.) is < 0.05 , result is statistically significant.

**There is a statistically significance differences in the trust issues scores of quantity surveyors and contractor

The result from the analysis entails that integrity ($P = .02 < 0.05$) was the only trust issue which the independent sample groups were found to be divided in their opinion. This suggests that there was a significant split in their opinion, despite both regard that the issue of integrity in the transaction of digital information was most significant (contractors $\bar{x} = 4.50$; quantity surveyors $\bar{x} = 4.07$). Owing to the aim of the research reported in this paper, this research (at this point of time) is unable to provide reasons to the P value currently observed (Integrity $P = .02 < 0.05$). It is suggested that further data should be gathered to provide insights on the differences of the P values observed.

5. CONCLUSIONS

This paper has presented a report from a study which aimed to determine the significant issues of trust in the transaction of digital information. The paper has outlined the rationale behind the study and the need to focus on information as the agent better collaboration among construction parties. It would be an interesting fact, at least within the scope explained, to appreciate the connection between the less-distinctive issues of trust in the transaction of digital information which is one of the backbones in the pursuit of IR 4.0. This signify the move by the industry today to embrace with the digital technologies (Ismail, Bandi, & Maaz, 2018; Maaz, Bandi, & Amirudin, 2018; Mohd, Ali, Bandi, & Ismail, 2019).

The adversarial character of construction has been the focus of the modern literature in construction management for quite sometimes. Innovative approaches to mitigate the effect of the siloed-mentality relationship had appeared through various studies conducted in Malaysia and around the world. These studies had found to focus on partnering (Awodele & Ogunsemi, 2010; Azlan Shah, Zuraidah, Anuar, Syahrul Nizam, & Pitt, 2010; Eriksson, Nilsson, & Atkin, 2008; Hamimah, Heap-Yih, Mohd Hafizuddin, & Norizan, 2011; Lee & Shin, 2013; Zuo, Chan, Zhao, Zillante, & Xia, 2013) where trust as an agent for improvement seems to take the centerstage in partnering (Bennet & Jayes, 1995; Gad & Shane, 2014; Laan, Noorderhaven, Voordijk, & Dewulf, 2011). Hence, the study reported in this paper, with trust becoming the main focus is significant to extend the current knowledge.

Beyond that, the extension to the study reported here is expected to provide finding on the manner two distinctive parties in construction perceive trust in transacting digital information. It would be an interesting finding to see, despite the advancement in technologies, the different perceptions that the groups might show, on this important aspect of human behavior. Perhaps the era of siloed mentality should be put to rest in return of a better collaborative environment the industry long need.

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