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Overcoming the Project Communications Management Breakdown amongst Foreign Workers during the COVID-19 Pandemic in Biophilia Inveigled Construction Projects in Malaysia

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Abstract: The property sector is revitalised to incorporate sustainability, specifically the biophilic design, to encourage human interaction with nature. Thus, there is an urgent need to communicate the biophilic design elements amongst stakeholders, especially the foreign workers, to ensure the project meets the requirement. However, standard project communications management is no longer practical, as the construction industry worldwide has been severely impacted by the Coronavirus Disease 2019 (COVID-19) pandemic. Hence, this paper evaluates the biophilic design elements to be communicated and examines the project communications management breakdown relating to the biophilic design elements in the Malaysian construction industry during the COVID-19 pandemic. Through a systematic literature review (SLR), focus group discussion (FGD) and questionnaire survey on 147 foreign workers, this paper found that from 33 biophilic design element items, only 1 item is categorised as highly critical, whereas another 20 items are categorised as critical. In addition, 43 potential communications management breakdown items from a total of 66 items fall under the critical category. The finding suggests that communication breakdown is caused by the language barrier amongst foreign workers from different ethnicities as well as between foreign workers and the supervisors, since face to face communication is limited during the pandemic.

Keywords: project communications management; foreign workers; biophilia; construction project; COVID-19; Malaysia

1. Introduction

Coronavirus Disease 2019 (COVID-19) has emerged as the millennial pandemic that has severely impacted various economic activities worldwide. On 11 February 2020, the World Health Organisation (WHO) declared the beginning of an unexplained black swan occurrence close to the World War Two economic scene [1] and was formally referred to as COVID-19 [2]. At first, the outbreak started in the People's Republic of China's remote town but eventually became a global pandemic [3]. Today, the death count has a surplus beyond two million globally and does not show any signs of slowing down, at least for now [4]. Some activities experienced a total shutdown as human involvement has been brought down to nearly zero. Similarly, many industries have faced the same predicament in Malaysia, especially the construction and manufacturing industries. However, both industries are categorised as one of the top five main contributors of gross domestic product (GDP) in Malaysia; however, currently experiencing contraction.

As COVID-19 is highly infectious, every construction worker is exceedingly vulnerable because of their working nature, including team effort and frequent communication. Hence, the Health Ministry of Malaysia (MOH) issued an advisory notice to close construction sites in Malaysia immediately because of its potential health risks [5]. This temporary measure is part of the Movement Control Order (MCO) enforced by the Government of Malaysia to curb the pandemic's greater spread. Due to this action, the construction industry's GDP saw a reduction of 44.9% in the first quarter of 2020 [6], as an impact of the COVID-19 pandemic not limited to the industry, but including the entire ecosystem that revolves around it. The other businesses suffered alongside construction materials suppliers, construction labour force suppliers, property sales and many others [7]. In fact, many projects are either delayed, cancelled or instructed to stop work due to non-compliance with the Prevention and Control of Infectious Diseases Act 1988 (Act 342) [8] and the Construction Industry Development Board Malaysia Act 1994 (Act 520) [9]. Likewise, with high infection rates in almost every country, this has led to a profound effect globally, especially in workplace environments defined by the '3C' conditions; crowded areas, close contact environments as well as confined and enclosed spaces such as manufacturing plants, construction sites and entire service industries, causing closure [10].

Overall, COVID-19 has had an unfavourable impact on the construction industry, with contracts substantially decreased by 39.5% from 9912 projects in 2019 to 5995 projects in 2020 [11]. The enforcement of the MCO and the COVID-19 Standard Operating Procedure (SOP) as defined by the National Security Council [12] is through the implementation of observance on social distancing and strict enforcement by reducing workers at the site and limiting face-to-face construction communications. As such, the dire need to restart the construction industry to continue constructing and maintaining infrastructures for other sectors while allowing them to maintain their momentum throughout the pandemic adds value to their capital and underpins national competitiveness. Therefore, overcoming the project communications management breakdown among foreign workers during the COVID-19 pandemic is essential.

As illustrated using the Quintuple Helix Innovation Model (Figure 1), understanding the project communications management breakdown will positively contribute to the five essential elements during the COVID-19 pandemic: environment, society, academia, industry, and government. It will be beneficial by reducing environmental impact through medical wastages, safeguarding socio-economic wellbeing, contributing towards novel finding for further research, perpetuating the construction industry's momentum, and supporting the national agenda as well as international initiatives such as the United Nations Sustainable Development Goal 3 (UN SDG 3). In other words, this guarantees workers' welfare and facilitates early completion, eliminates losses, and solves construction disruption in the supply chain.

However, Sambasivan and Soon [14] identify ten primary causes of project failure, one of which is the lack of communication between parties. Another essential point is that the construction industry's poor performance is frequently attributed to ineffective communication management on-site [15–20]. Notwithstanding the above, Safapour et al. [21], Yap et al. [22], and Olanrewaju et al. [23] noted that very few studies on communications management in the construction industry had been undertaken. Henceforth, it is critical to understand the communication breakdown in today's environment to ensure that project communications management practices in the construction industry evolve in response to new requirements and enhancements.

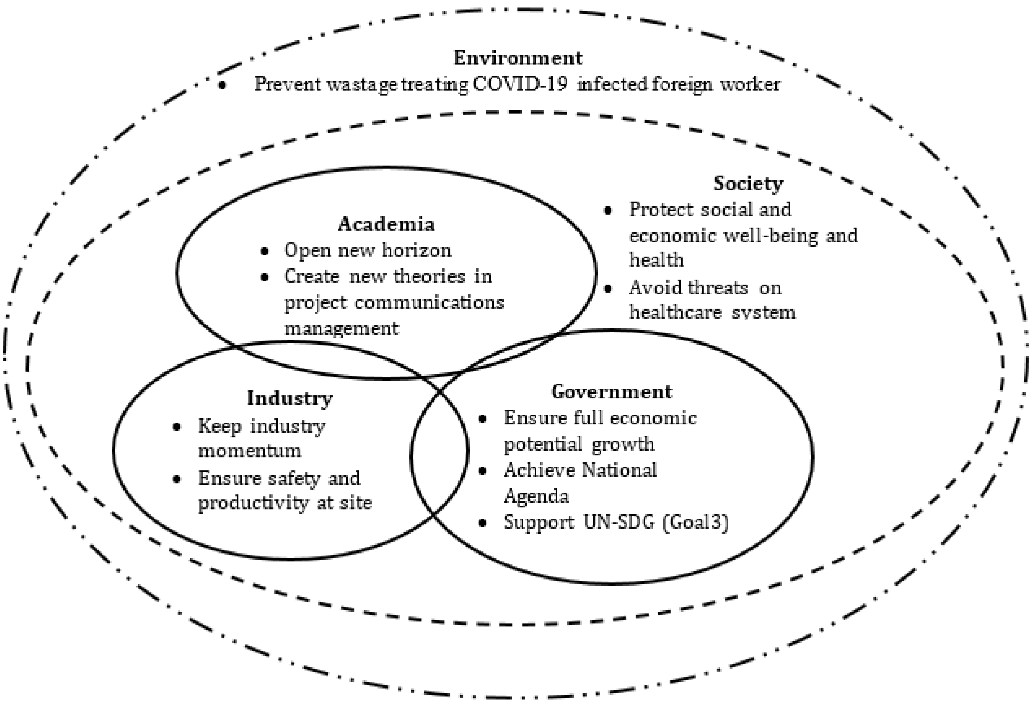

Figure 1. Significance of study based on Quintuple Helix Innovation Model (adopted from [13]).

In addition, construction projects with biophilic elements, which are seen as a new architectural concept [24], are not spared from the impact of COVID-19. In fact, the biophilia inveigled projects are expected to face challenges in ensuring the crucial elements are well communicated, considering the stringent COVID-19 SOP that is in place. Thus, ascertaining the site workers comprehend the fundamental requirement of biophilic design with limitations at the site, sparks the dire need for specifically designed project communications management.

Subsequently, this paper will carefully examine the project communications management elements to grasp the possible breakdown that takes place when conveying information between the various stakeholders, particularly during the COVID-19 pandemic. Next, the biophilic design elements will be articulated to understand the critical components that require an interminable information exchange to ensure project success. By intervening these two details, the paper will propose crucial elements that will help overcome the project communications management breakdown amongst foreign workers during the COVID-19 pandemic in biophilia inveigled construction projects in Malaysia.

Overall, this paper intends to answer the following research questions; what are the important biophilic design elements during information exchange and how to significantly convey the details to the foreign worker through the identified communication channels? The end result will be a deeper understanding of how to manage communications in the construction industry.

2. Biophilic Design Elements

Generally, biophilic-inveigled projects have garnered interest due to their concept of amalgamating the natural environment with lifestyle. Biophilic adapts the concept of encouraging people's physical and mental wellbeing to remain dependent on interaction with natural systems and processes [25]. Furthermore, Söderlund [26] adds that the idea of biophilic architecture started as a collective initiative, one that brings together those who are firmly rooted in their local communities and agrees that a modern approach to urban design is required. Hence, biophilic cities provide landscaping to and from homes, walls, paths and concrete streams to bring nature into the city [27]. Since the idea of biophilic combines human needs and nature, biophilic is increasingly common in community planning [28].

Additionally, Xue et al. [29] stressed that "biophilia", such as a vibrant and varied natural area, also leads to social and family relationships in today's culture and is helpful to those who live in high-density urban environments. The study has shown that urban nature promises several advantages, including lower violence, better psychological wellbeing, decreased stress, depression and anxiety, enhanced efficiency, improved disease recovery, increased tolerance, increased treatment and cognitive capacity and child development benefits [30].

In Malaysia, the urban population is expected to rise from 74.3% in 2015 to 79.6% in 2025, where the total urbanisation rate is to be sustained below 85% by 2040 [31]. Increasing urbanisation and accelerated growth has led to several concerns, such as air pollution, urban waste management, traffic congestion and inefficiency in the use of energy and services (land, space, energy and clean water). Hence, to resolve the anticipated urban problems associated with rapid urbanisation, the Ministry of Housing and Local Government (KPKT) established the Malaysia Smart City System [31]. Furthermore, the National Urbanisation Strategy 2 (NUP 2) stresses that biophilic-influenced architecture is anticipated to push the city centre's intensive growth to another level by ensuring pedestrian and cycling connectivity, community centres, a large variety of parks and city forests, where these characteristics accentuate that planning should include environmental sustainability, social and economic needs [32].

Considering both government policy statements and human preferences, biophilic design elements are projected to be incorporated in every new development. As such, these design elements have to be communicated clearly, explaining the importance of biophilia in general to every site worker involved in the process of developing the township. Inculcating the seriousness in adopting the concept is crucial as it encourages individual involvement in ensuring success. According to Cabanek et al. [33], understanding the biophilic design will fulfil the intention to meet the advantages of human–nature interaction within a contemporary built environment, incorporating nature in houses, buildings both internally and externally within an urban environment setting. Acknowledging the importance of understanding biophilic design elements, Arof et al. [28] state 8 criteria and 45 design elements that would help the designers and developers comprehend it, thus, helping in future project development. These eight criteria are building, block, street, neighbourhood, community, region, environment and sensory. However, only building, block and street are communicable during the construction phase of a biophilic project.

Based on the ideas of Kellert [25], there are collectively nine values, namely, aesthetic, dominionistic, humanistic, moralistic, naturalistic, negativistic, scientific, symbolic and utilitarian that resemble the human reliance towards natural systems emerging from a deep understanding of human self-interest through constant contact with the environment. Based on the definition and adaptive benefits criteria of the nine values, only aesthetic involving the design and utilitarian values, which focus on the practicality of implementation as well as materials, have direct involvement in construction activity that requires an effective communications management approach. Similarly, Forgeard et al. [30] narrowed down to only three essential biophilic design elements, namely, building, neighbourhood and city. However, the elements are further subdivided into eight features that simplify the actions required. Despite the subdivision, only building, which is further broken into indoor plants, green roofs and green walls, requires design details and additional fittings, thus, has to be communicated well during the construction phase.

In the same way, Cabanek et al. [33] identified building facades, road reserves and pocket parks as important design elements for conceptualising the biophilic within a development. Various design functions support these design elements to enable the effectiveness of its implementation. The design element that focused on building involves construction design and planning that consists of the integration of vertical greenery, planter boxes, green roofs and balconies, and the functional architecture design that is common. However, Cabanek et al. [33] warned about future problems and the agreement associated with the new concept, which may include high initial construction costs, high maintenance costs and reduced on-street parking due to green infrastructure growth within street media. Therefore, it is vital to communicate the biophilic design requirements in a structured manner to avoid errors that would lead to cost overrun [34] and delays [35].

Table 1 illustrates the five main biophilic design elements that various authors commonly mention due to their essential role in introducing nature elements in a particular development. However, only three biophilic design elements, namely, building, street and block/cluster, have the capacity to influence during the structural and architectural design phase of a development project. Since the biophilic concept is relatively new and has often misled the main stakeholders involved in city planning and development [24,28], the details have to be well communicated to all stakeholders involved in the project. This will help increase the awareness level and mitigate possible errors that would result in delays and cost overruns.

Table 1. Main biophilic design elements.

Design Elements	Arof et al. [28]	Cabanek et al. [33]	Forgeard et al. [30]	Kellert [25]	Newman [27]	Söderlund [26]	Xue et al. [29]	el-Baghdadi and Desha [36]	Wijesooriya and Brambilla [37]	Jiang et al. [38]
Street	x	x		x				x	x	
Building	x	x	x		x	x	x	x	x	x
Block/Cluster	x	x			x				x	x
Surroundings/ Environment	x		x	x	x	x	x	x		x
Neighbourhood/ Community	x		x	x	x		x			

Source: Adopted and modified from [25–30,33,36–38].

A well-designed project communications management approach is undoubtedly needed, especially during the Coronavirus Disease 2019 (COVID-19) pandemic. The pandemic has forced various restrictions on on-site working conditions, where project communications management implementation is no longer as usual. Social distancing and a limited number of workers at a time pose a risk in conveying biophilic design details to the site workers. Failure to communicate the design requirements may possibly lead to late project handover and cost escalation [17,22,39], especially when involving the biophilic elements that are new to the site workers.

3. Project Communications Management

Communication is the transfer of information to achieve a shared understanding, which is characterised as a transmission mechanism involving a common understanding among individuals or groups. This is achieved by sharing thoughts, photos or facts, such as words, photos, gestures, written materials or acts [40]. Communication, in theory, is based on the Latin word "communis" which carries the meaning of "communication", where it means "to communicate" "to make common" and "to make known" through either verbal or nonverbal communication, using an electronic platform or a combination [41], therefore, regarded as a knowledge exchange that can be performed in writing or orally via an upward, downward or lateral communication manner.

The Project Management Institute [42] highlighted that project communications management is most critical during the planning, execution, monitoring and controlling stage. On the other hand, the PMI [42] also defines project communications management as an important mechanism for evaluating project and stakeholder knowledge needs through undertaking practices that improve information exchange's efficacy. Three communication models have been foundational for the development of different communication frameworks, namely, linear, interactional and transactional, where each takes a distinct interpretation of the mechanism of communication [43,44]. The most widely used model is linear, demonstrating how a sender conveys a message to the receiver through different communication channels, with the influence of noise/barrier.

In general, the existing complexity of construction projects spanning across various stakeholders has long raised the likelihood of risks to project communication management efficiency [45]. Information exchange is crucial since changes often occur during the implementation of a task in a project. In reality, each project remains unique in terms of key elements. Moreover, a project may include either a single unit or several units from the same organisation and extend through several organisations. The presence of various partners varies when others leave and others join the project after the operation is over and proceeds to the next milestone [23]. Furthermore, improved project communications management can lead to innovations, enhanced technological strategies, a good effect on all partners and better decision making [46].

Through an extensive literature review, eleven common communication channels used in a construction project, as illustrated in Table 2, are identified, namely, formal communication, informal communication, team meeting discussion, project reports, site review meeting, the work breakdown structure (WBS), organisational breakdown structure, resource breakdown structure, record management system, technology and employee suggestion scheme. It is important to note that, during the construction project's progress, the details will be stored, collected and shared in the form of drawings, specifications, notes, messages, memos, templates, catalogues, instruction manuals and pictures. Hence, communication is only effective if the sender's information is interpreted by the recipient as meant. Therefore, initiatives to share information would be pointless if the receiver fails to comprehend the information.

Table 2. Common communication channels in the construction industry.

Communication Channel	**Rahman and Gamil [20]**	**Harikrishnan and Manoharan [47]**	**Olaniran [48]**	**Petter and Nils [49]**	**Zulch [50]**	**Olanrewaju et al. [23]**	**Lee and Kim [18]**	**Wu et al. [51]**
Team meeting discussion	x	x	x	x	x	x	x	x
Project reports	x	x	x	x	x	x	x	x
Site review meeting	x	x	x	x	x	x	x	x
Formal communication	x	x	x	x	x	x		
Informal communication	x	x	x	x	x	x		
Work breakdown structure (WBS)	x	x	x		x		x	x
Organisational breakdown structure	x	x	x				x	x
Record management system	x	x		x	x		x	
Technology	x		x	x				
Employee suggestion scheme	x							
Resource breakdown structure			x				x	x

Source: Adopted and modified from [18,20,23,47–51].

Commonly, the complexity of construction projects with numerous stakeholders' involvement amplifies the project communications management's potential threats. Hoezen et al. [46] and Holzmann and Globerson [52] observed that the effects of different construction industry stakeholders frequently contribute to sharing fragmented, unclear and delayed information. Moreover, Wu et al. [51] and Subramaniam et al. [53] stressed that project communications management is even more important since multiple parties are active and participate in various project phases due to its decentralised working nature. According to Lee and Kim [18], individuals across different backgrounds and levels of knowledge have a somewhat different understanding of the same knowledge than the rest spontaneously, which these understandings broadly differ at the foreign worker's level.

Additionally, Abuarqoub [15] and Valitherm [54] suggest that the language barrier is a critical communication potential threat between managers and foreign workers. The language barrier is not new to the Malaysian construction industry stakeholders since out of 1.99 million foreign workers registered, 429,552 are recorded under the construction industry [55]. This language barrier is deteriorating as foreign workers, who consist of numerous nationalities of different languages, slang, accents and dialects, may have critical miscommunication breakdowns. Table 3 illustrates the common project communications management breakdown faced in the construction industry.

With the requirements of the Coronavirus Disease 2019 (COVID-19) Standard Operating Procedure (SOP) added with biophilic design elements that are seen as new in the construction industry, it certainly deters the adoption of the usual project communications management practices, thus, requires a different approach in conveying information or messages. According to Tang [59], miscommunication is highly likely due to confusion created by multiple SOPs during the COVID-19 outbreak. Similarly, Teo and Loosemore [60] suggest that the absence of an industry-standard or unified protocol will lead to uncertainty and more confusion resulting in excessive waste or repeated operation. By introducing multiple SOPs, the risk of miscommunication during the COVID-19 outbreak is unquestionably high, hence, warrants the information source to be of utmost reliability [61]. Additionally, Safapour et al. [21] stress that project communications management plays an essential role in preventing such problems and mitigating existing COVID-19 risks among foreign workers, but only if it successfully conveys information from the sender to the receiver continuously. Considering the PMI [42] highlighted that 90% of the time is spent in communication among those involved in a project, it further validates the crucial role of project communications management. As such, a formidable strategy for project communications management becomes necessary, especially when the COVID-19 pandemic intensifies the situation [62] added with the new design requirements due to the adaption of biophilic elements.

Therefore, this paper set the objectives to evaluate the biophilic design elements that need to be communicated and examine the communications management breakdown when relating to the biophilic design elements in the Malaysian construction industry during the COVID-19 pandemic.

Table 3. Common project communications management breakdown in the construction industry.

Communication Breakdown	**Olaniran [48]**	**Ejohwomu et al. [56]**	**Djajalaksana et al. [57]**	**Rahman and Gamil [20]**	**Wu et al. [51]**	**Nadae and Carvalho [58]**	**Holzmann and Globerson [52]**	**Valitherm [54]**	**Lee and Kim [18]**	**Abuarqoub [15]**
Distorted information	x	x		x	x		x	x	x	x
Multiple stakeholders	x	x		x		x	x		x	
Usage of technical jargon		x	x		x	x	x			x
Language barrier	x	x	x	x				x		x
Late information dissemination	x	x			x		x	x	x	
Unclear communication channel	x	x		x	x		x		x	
Lack of necessary skills	x		x		x	x	x			
Multi-cultural work environment	x	x	x					x		x
Personality factor	x		x	x		x		x		

Source: Adopted and modified from [15,18,20,48,51,52,54,56–58].

4. Methodology

Focus group discussion (FGD) based on a semi structured questionnaire was used to conduct an interview [63,64] among carefully selected respondents based on their experience and depth of involvement in biophilic-inveigled construction projects to ensure valuable feedback was gathered. Prior to the FGD, the respondents consisting of two civil engineers, a town planner, a quantity surveyor and a landscape architect with extensive experience in the area of biophilic projects spanning over 18 number of years, were requested to complete the consent form in line with the requirements of Personal Data Protection Act (PDPA) to protect both the respondents and the researcher. The five biophilic design elements were building, street, block/cluster, surrounding environment and neighbourhood. The first three classified as design and the latter as nature and human value, respectively, were introduced to the FGD respondents. Since the paper focuses on the key biophilic elements necessary for drafting a communication plan to overcome the project communications management breakdown among foreign workers, especially during the Coronavirus Disease 2019 (COVID-19) pandemic, the FGD was guided by 15 semi-structured, in-depth interview questions on all five respondents.

This was followed by the circulation of validated questionnaires to two construction projects managed by Class F contractors registered under the Construction Industry Development Board (CIDB) in Malaysia. Several construction sites operating during the Movement Control Order (MCO) were approached for the purpose of data collection. Out of which, only four sites agreed to allow access to conduct data collection activity; however, the survey team's movement in the site was restricted. On top of it, the number of survey team members was reduced and they were required to strictly adhere to the COVID-19 Standard Operating Procedures (SOPs), which require a mandatory swab test for all survey team members.

The questionnaires were translated with the assistance of the respective foreign embassies as well as high commission representatives, and a pilot test was conducted to ascertain its validity and reliability. The reliability analysis was carried out to determine the consistency of data collected and ensure that the instrument used to demonstrate acceptable reliability in order to continue the study was acceptable. Creswell and Creswell [65] explained that internal consistency is quantified by a Cronbach's alpha (α) value that ranges between 0 and 1, with optimal value ranging between 0.7 and 0.9. According to George and Mallery [66], the Cronbach's alpha value that is less than 0.6 is considered low, while the value of 0.7 and above is accepted.

The data garnered from the questionnaire survey were analysed through Rasch Model using WINSTEPS software. For this paper, two analyses were conducted, which were the reliability and validity analysis as well as the person–item distribution map analysis (PIDM). Rasch model was chosen based on its ability to develop a hypothetical unidimensional line where items and persons are rated based on their difficulty and ability to measure, which is presented using the PIDM [67,68]. Moreover, Boone [69] described that Rasch analysis is a psychometric technique developed based on the concept of linearity to enhance the accuracy of instruments, the quality of instrument monitoring and the performance of respondents; thus, able to understand the different views obtained from the surveys.

5. Results and Analysis

5.1. Evaluating Biophilic Design Elements during Construction Stage through a Focus Group Discussion (FGD)

This paper evaluated the various biophilic design elements that were identified through a systematic literature review. The five key biophilic design elements frequently highlighted by various researchers were presented during the focus group discussion (FGD). All FGD respondents were satisfied and vehemently agreed that the identified biophilic design elements were deemed crucial and fit to be categorised as important biophilic design elements. While this is the case, the respondents had conflicting views on evaluating the biophilic design elements based on their most significant importance.

Despite this, respondents agreed that biophilic elements that are crucial during the planning and construction stage are the street, building and block/cluster. According to the respondents, only these three biophilic elements have a greater influence to ensure a successful biophilic inveigled project implementation that would satisfy the client and end-user. Furthermore, they collectively agreed that these design elements must be well communicated to avoid any possible project failures, hence, emphasising project communications management. Table 4 summarises the social-demographic characteristics of the respondents.

Table 4. Focus group discussion (FGD) respondent summary.

Respondent	Years of Experience in Biophilic Projects	Number of Biophilic Project Involved	Professional Certification	Responsibility
Expert 1	16	6	• Professional Engineer with Practising Certificate (PEPC)—Board of Engineers Malaysia (BEM) • Professional Technologist—Board of Technologist Malaysia (MBOT)	Resident Engineer
Expert 2	18	4	• Registered Quantity Surveyor—Board of Quantity Surveyors Malaysia (BQSM) • Professional Technologist—Board of Technologist Malaysia (MBOT)	Senior Quantity Surveyor
Expert 3	15	6	• Registered Town Planner—Board Town Planner Malaysia	Senior Town Planner
Expert 4	10	5	• Professional Engineer with Practising Certificate (PEPC)—Board of Engineers Malaysia (BEM) • Professional Technologist—Board of Technologist Malaysia (MBOT)	Project Manager
Expert 5	11	3	• Registered Landscape Architect—Institute of Landscape Architect Malaysia	Landscape Architect

5.2. Examining the Communications Management Breakdown amongst Foreign Workers during the COVID-19 Pandemic

5.2.1. Reliability and Validity Analysis

Based on Tables 5 and 6, with the α value of 0.97 and 0.79, respectively, the instrument used for this paper was optimal and reliable [65,66]. Furthermore, the Person Reliability (β) value of 0.97 and 0.77, respectively, supported with a Standard Error (SE) of 0.11 and 0.03, respectively, clearly suggests that the respondents were competent to answer the questionnaire survey [70].

Table 5. Summary of 147 measured persons for effectiveness of communication channels in conveying the biophilic design requirements.

		Count	Measure	Model Error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean		147.0	0.00	0.10	0.95	−0.06	0.91	−0.9
S.D		0.0	0.62	0.00	0.22	2.1	0.24	2.1
Max		147.0	1.12	0.11	1.37	3.1	1.43	3.2
Min		147.0	−0.97	0.10	0.52	−5.1	0.51	−4.8
Real RMSE	0.10	**True SD**	0.61	**Separation**	5.85	**Person Reliability**		0.97
Model RMSE	0.10	**True SD**	0.61	**Separation**	6.05	**Person Reliability**		0.97

S.E. of Person Mean = 0.11.

Table 6. Summary of 147 measured persons for communication breakdown in the Malaysian construction industry during the COVID-19 pandemic.

		Count	Measure	Model Error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean		147.0	0.00	0.10	1.00	−0.2	1.03	−0.2
S.D		0.0	0.23	0.00	0.33	2.5	0.52	2.5
Max		141.0	0.69	0.11	2.17	6.9	3.26	8.4
Min		141.0	−0.41	0.10	0.52	−4.5	0.48	−3.9
Real RMSE	0.11	**True SD**	0.20	**Separation**	1.80	**Person Reliability**		0.77
Model RMSE	0.11	**True SD**	0.21	**Separation**	1.96	**Person Reliability**		0.79

S.E. of Person Mean = 0.03.

5.2.2. Person–Item Distribution Map (PIDM)

The Effectiveness of Communication Channels in Conveying the Biophilic Design Requirements in the Malaysian Construction Industry during the COVID-19 Pandemic

A questionnaire survey with 33 items was developed based on three components of biophilic design elements and 11 components of project communication channels. The questionnaires were then distributed to 147 foreign workers in the selected construction industry in Malaysia. Figure 2 displays the result obtained through the person–item distribution map analysis (PIDM), where only one item was categorised as strongly agree, which was TMB (the biophilic design element—building—was well explained through team meeting discussions).

Another 20 items fell under the agreed category, which were PRS (biophilic design element—street—was well explained through project reports), PRB (biophilic design element—building—was well explained through project reports), PRBC (biophilic design element—block/cluster—was well explained through project reports), TS (biophilic design element—street—was well explained through technology-based information), TB (biophilic design element—building—was well explained through technology-based information), TBC (biophilic design element—block/cluster—was well explained through technology-based information), ICB (biophilic design element—building—was well explained through formal communication), RMSB (biophilic design element—building—was well explained using the record management system), RMSBC (biophilic design element—block/cluster—was well explained using the record management system), RMS (biophilic design element—street—was well explained using the record management system), SRMB (biophilic design element—building—was well explained through site review meetings), SRMBC (biophilic design element—block/cluster—was well explained through site review meetings), TMS (biophilic design element—street—was well explained through team meeting discussions), TMBC (biophilic design element—block/cluster—was well explained through team meeting discussions), FCB (biophilic design element—building—was well explained through formal communication), FCBC (biophilic design element—block/cluster—was well explained through formal communication), FCS (biophilic design element—street—was well explained through formal communication), WBSB (biophilic design element—building—was well explained through the work breakdown structure (WBS) diagrams), WBSBC (biophilic design element—block/cluster—was well explained through the work breakdown structure (WBS) diagrams) and WBSS (biophilic design element—street—was well explained through the work breakdown structure (WBS) diagrams).

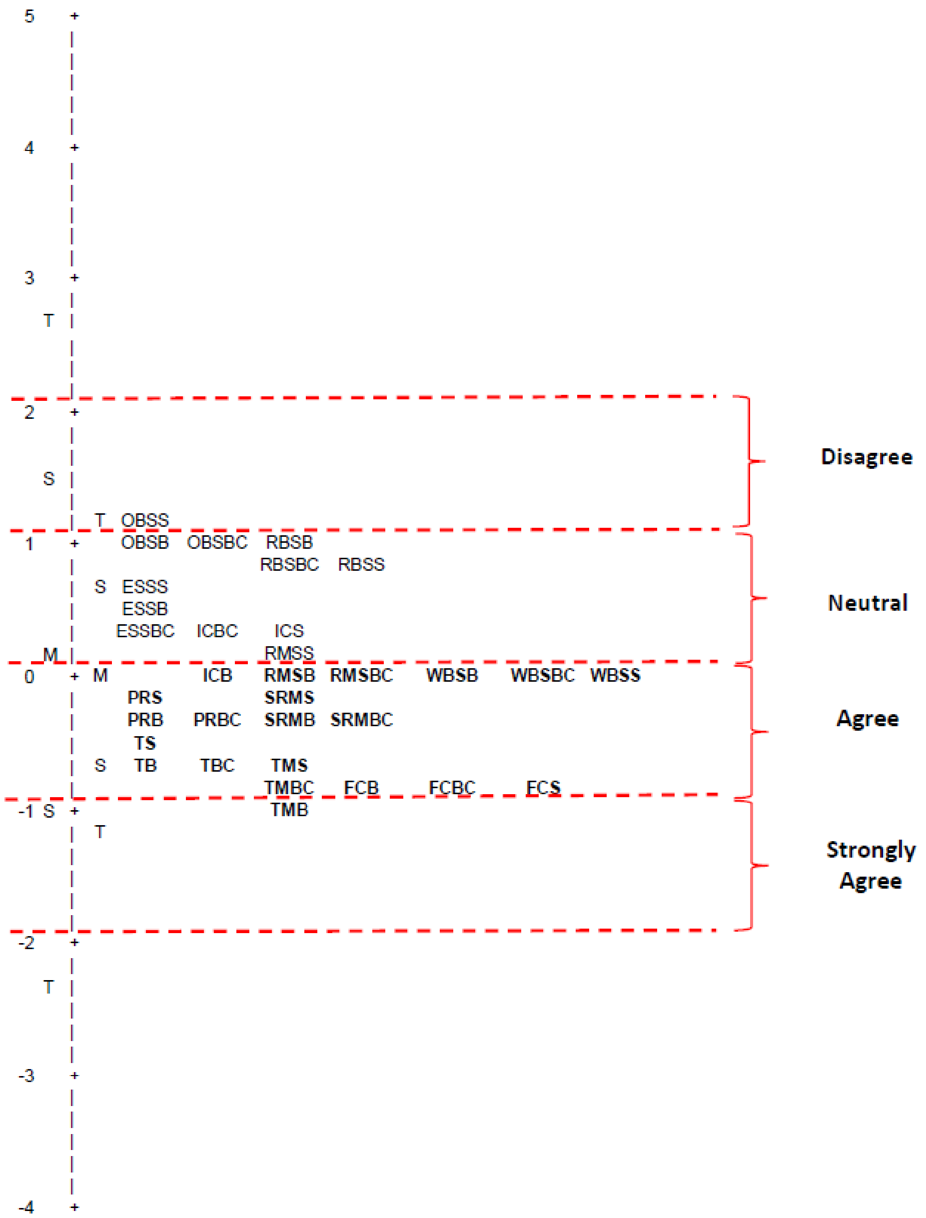

Figure 2. Person-item distribution map (PIDM) for the effectiveness of communication channels when relating to the biophilic design requirements.

The Potential Project Communications Management Breakdown amongst Foreign Workers during COVID-19 for Biophilic Inveigled Projects

For this paper, a set of questionnaires with a total of 66 questions derived from 11 components of project communication channels attested with 6 components of communication efficacy elements was developed. The questionnaires were then circulated amongst 141 foreign workers from identified construction projects in Malaysia. Upon conducting the person–item distribution analysis (PIDM), none of the items fell under the strongly agree category as shown in Figure 3.

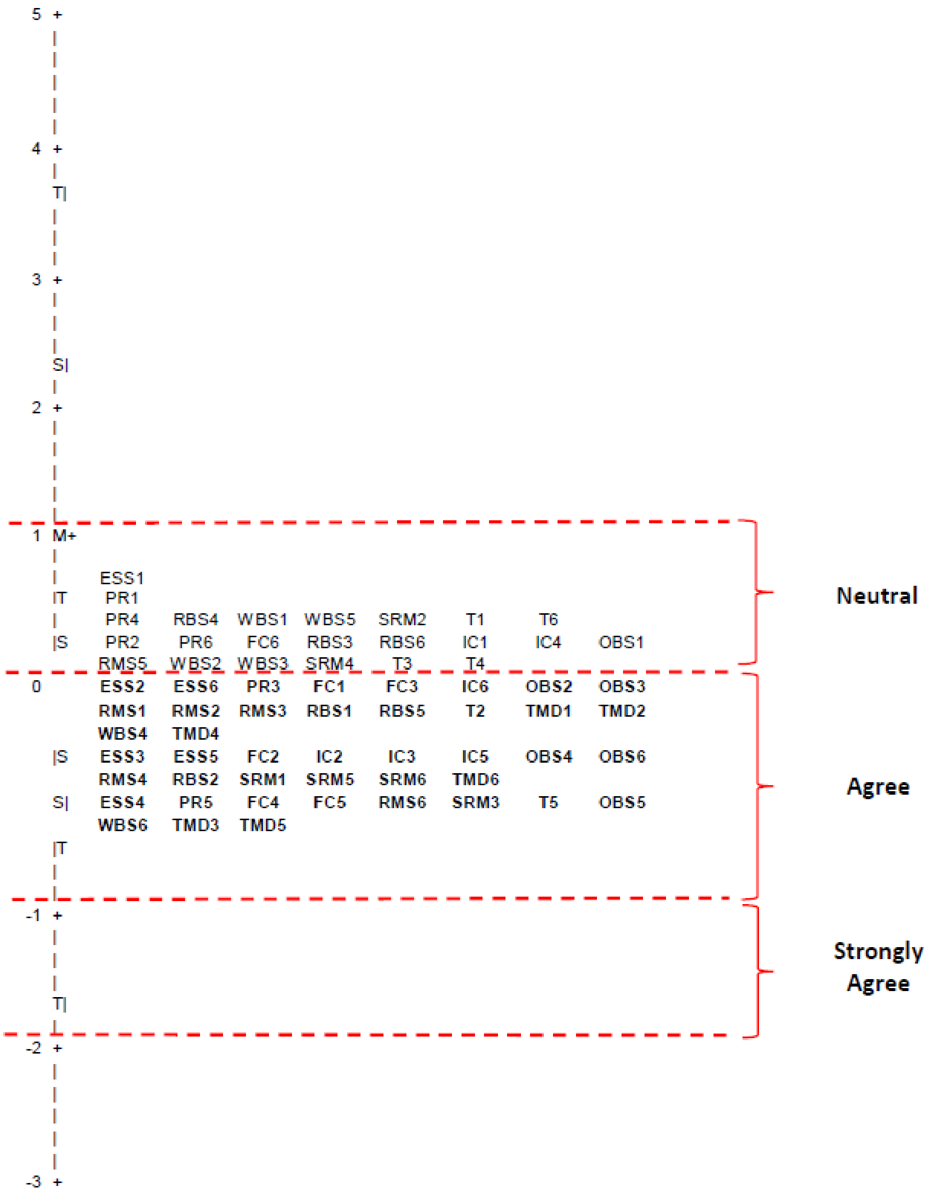

Figure 3. Person–item distribution map (PIDM) for communication breakdown in the Malaysian construction industry during the COVID-19 pandemic.

However, 43 items, which was more than half of the total items tested, were found to fit into the category of agree. The items were ESS2 (procedures to submit suggestions through the employee suggestion scheme are complicating), ESS3 (limited access to submit through the employee suggestion scheme), ESS4 (unable to understand the details required by the employee suggestion scheme), ESS5 (delay in executing the employee suggestion scheme by the upper management), ESS6 (delay in executing the employee suggestion scheme by the upper management), RMS1 (unable to optimise the record management system based on site condition), RMS2 (procedures in record management system are complicating), RMS3 (limited access to the record management system), RMS4 (unable to understand the technical details), RMS6 (lack of details in the record management system), WBS4 (unable to understand the technical details), WBS6 (lack of details in the work breakdown structure), TMD1 (workers are not well represented in the team meeting discussion), TMD2 (procedures related to the team meeting discussion are complicating), TMD3 (low level of language proficiency negatively impacts team meeting discussion), TMD4 (unable to understand the technical details in the team meeting discussion), TMD5 (lack of regular team meeting discussions), TMD6 (lack of details discussed in the team meeting discussion), RBS1 (unable to decipher the resource breakdown structure based on site condition), RBS2 (procedures in resource breakdown structure are complicating), RBS5 (delay in resource breakdown structure related information flow from the upper), PR3 (limited access to the project reports related documents), PR5 (delay in project reports related information flow from the upper management), FC1 (unable to decipher the formal instructions based on site condition), FC2 (formal instructions are complicating), FC4 (unable to understand the technical details in the formal instruction related), FC5 (delay in formal information flow from the upper management), SRM1 (workers are not well represented in the site review meeting), SRM3 (low level of language proficiency negatively impacts site review meeting), SRM5 (lack of regular site review meetings), SRM6 (lack of details discussed in the site review meeting), IC2 (informal communications are complicating), IC3 (limited access to informal communication related documents), IC5 (delay in informal communication flow from the upper management), IC6 (lack of details in the informal communication), OBS2 (procedures in organisation breakdown structure are complicating), OBS3 (limited access to the organisation breakdown structure related documents), OBS4 (unable to understand the technical details), OBS5 (delay in organisation breakdown structure related information flow), OBS6 (lack of details in the organisation breakdown structure), T2 (procedures to access information from technology based communication platform are complicating) and T6 (lack of details recorded in the technology based communication platform).

5.2.3. Summary of Person–Item Distribution Map

Based on the person–item distribution map analysis (PIDM) for both effectiveness of communication channels in conveying the biophilic design requirements and communication breakdown in the Malaysian construction industry during the Coronavirus Disease 2019 (COVID-19) pandemic in Figures 2 and 3, items that were categorised under agree and strongly agree were arranged according to the respective components. It is noticeable that respondents felt eight components had to be given extra attention to overcome communication management breakdown amongst foreign workers. Table 7 lists the critical components, namely, team meeting discussion, formal communication, record management system, site review meeting, informal communication, work breakdown structure (WBS), project reports and technology.

Table 7. Summary of person–item distribution map for communication breakdown and biophilic design elements.

Critical Components	Agree		Strongly Agree	
	Communication Breakdown Items	**Biophilic Design Element Items**	**Communication Breakdown Items**	**Biophilic Design Element Items**
Team meeting discussion	TMD1, TMD2, TMD3, TMD4, TMD6,	TMS, TMBC	-	TMB
Formal communication	FC1, FC2, FC3, FC4, FC5	FCS, FCB, FCBC	-	-
Record management system	RMS1, RMS2, RMS3, RMS4, RMS6	RMSB, RMSBC	-	-
Site review meeting	SRM1, SRM3, SRM5, SRM6	SRMS, SRMB, SRMBC	-	-
Informal communication	IC2, IC3, IC5, IC6	ICB	-	-
Work breakdown structure (WBS)	WBS4, WBS6	WBSS, WBSB, WBSBC	-	-
Project reports	PR3, PR5	PRS, PRB, PRBC	-	-
Technology	T2, T5	TS, TB, TBC	-	-

The critical components were further scrutinised to examine the communications management breakdown when relating to the biophilic design elements during the COVID-19 pandemic. These items require additional attention to eliminate potential project failure during project information exchange. Furthermore, it is evident that team meeting discussions play a crucial role in explaining the biophilic design element—building—and faces potential communication breakdown in five of the six items examined.

6. Discussion

In a larger perspective, the result from the Rasch model analysis displayed that communicating biophilic design elements amongst the foreign workers during the Coronavirus Disease 2019 (COVID-19) pandemic did not entirely fail, with only one item indicated as highly crucial. This further validates the current state of the overall construction industry performance upon resuming activities at the site during the Movement Control Order (MCO), where project communications management was manageable but required immediate attention.

Even though the post-COVID-19 progress is reportedly slow, mainly due to the adaptation of new norms and adherence to COVID-19-related standard operating procedures [71], the construction industry's momentum is slowly picking up. In the same way, based on a study on the socio-economic impacts of COVID-19 in Malaysia by the International Labour Organization (ILO), the construction industry's influence is only rated as medium together with financial, mining and quarrying services [72]. However, it is essential to note that all 21 items of biophilic design elements and 43 items of project communication channels were critical as they fell under the agree category. Hence, it is crucial to ensure that the project communications management plan maintains communication channel effectiveness to avoid these items from falling into the strongly agree range that would eventually lead to project failure.

Based on the analysis, emphasis should be given to team meeting discussion since it was rated as the most important communication channel and crucial in determining the biophilic design elements were well understood by the foreign workers. This paper also revealed that foreign workers were not well represented in the team meeting discussion as well as during the site review meeting and usually lacked in discussion details. Moreover, the language barrier seemed to cause the inability of foreign workers to understand the discussion details and the technical inputs shared. Furthermore, Kwofie et al. [73] and Khoshtale and Adeli [74] similarly found that team meeting discussions and site review meetings are fundamental to a successful transfer of knowledge, especially when it involves the technical details of a project.

According to Al Nahyan et al. [75], Nadae and Carvalho [58] and Dang, Le-Hoai and Kim [76], since the construction industry is complex in nature, the implementation of a structured knowledge management system helps in communicating technical details to maintain the industry's long-term competitive advantages. Similarly, this paper finds that the record management system plays a significant role in project success, especially if the biophilic design elements are simplified to understand better. In the same way, respondents also expressed that, due to their inability to understand the descriptions registered, the record management system implemented was under optimised.

Additionally, this paper also unfolded that foreign workers find it difficult to comprehend formal and informal communication due to complicating instructions, especially technical details. In fact, some indicated that either they had limited access to instructions through formal and informal communication or it reached them late. Hence, site activities progress faster than the rate of information exchange. For that reason, Forcada et al. [77] highlighted that timely and accurate information is critical for all project stakeholders because it serves as the foundation for decisions and is the means by which physical progress is made.

On top of that, considering the paper's overall outcome, priority should be given to overcome the language barrier due to the low level of language proficiency the construction workers face. This is significant when the Malaysian construction industry largely depends on foreigners from various countries [55] with different education backgrounds, technical knowledge, and language proficiency [18]. Furthermore, Abuarqoub [15] and Valitherm [54] pointed out that the language barrier in the Malaysian construction industry could potentially contribute to communication breakdown, thus, leading to failure in biophilic-inveigled construction projects.

7. Conclusions

In conclusion, the enforced Coronavirus Disease 2019 (COVID-19) Standard Operating Procedure (SOP) by the Government of Malaysia puts extra pressure on the construction industry with stringent communication platforms allowed, limited face to face communication and a reduction in physical site document exchanges at construction sites. With such restrictions in place, this paper revealed that team meeting discussions are the best platform to overcome language barriers and different knowledge levels during the pandemic. Nonetheless, the team meeting discussions cannot be held as frequently as before to explain biophilic design elements' requirements and technical details due to the SOP.

For that reason, the Malaysian construction industry certainly requires a comprehensive project communications management approach to overcome the potential biophilic design information flow breakdown during the pandemic. The proactive measure will help to achieve the desired biophilic design outcome; thus, keeping the construction industry afloat during this critical period. It also indirectly strengthens the construction industry that has potential economic growth for development and facilitates development planning in line with the aspiration of Malaysia's Shared Prosperity Vision 2030 and achieves Malaysia's National Urbanisation Strategy 2 to foster biophilic design elements into future property development projects. Globally, this effort undoubtedly contributes to the UN Sustainable Development Goal 3 (SDG 3) objective of safeguarding the wellbeing of construction industry stakeholders during this unprecedented era of the COVID-19 pandemic. From the perspective of energy businesses, the findings of this paper led to the efficient use of energy and services in terms of land, space, energy and clean water through the project communications management in overcoming the potential biophilic design information flow breakdown during the COVID-19 pandemic. Furthermore, the findings can be utilised and replicated to develop project communications management strategies for other industries, namely, manufacturing, agriculture, plantation, fisheries and mining, especially throughout the uncertain waves of the COVID-19 pandemic.

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