



The Impact of Human Relationships to Material Acquisition in Construction Projects

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Abstract: Construction projects have long been plagued with issues of delays, over budget and poor quality. One of the main factors that have been associated with the common issues is material acquisition, with delays in the arrival of material, poor material quality, materials that do not comply with the required specification, unavailability of required construction materials, damaged materials, loss of construction materials sent to site, theft and vandalism. Even though construction material acquisition is an arising problem in the industry, the studies conducted in this area is still scarce. Previous studies have mainly focused on isolated subjects in material acquisition, rather than the entire spectrum on the subject matter. Therefore, this study aims to establish the improvement strategies for construction material acquisition from the human relationships perspective. A quantitative questionnaire was sent to the respondents via email, personally distributed to the contractor's office, WhatsApp's application and google form to 1200 active contractor that have been registered with CIDB Malaysia under grade G7. The respondents were limited to purposive sampling criteria which have been determined earlier. Based on the data from 286 questionnaires, findings in this research were structured and analysed using descriptive statistical analysis (mean, standard deviation and frequency) with the aid of SPSS24 software. Finding from the results revealed that the improvement of human relationship was critical to improve construction material acquisition hence, addressing urgent issues including long term relationship such as trust, experience, and responsiveness, clearly understand the client's needs and objectives, establish strategic partnership with suppliers and long-term resources commitment achieved the highest percentage from respondents. Finally, the study on the impact of human relationships to material acquisition in construction projects can be used as a guidance to enhance the construction material acquisition approach for contractors undertaking projects in Malaysia.

Keywords: Material acquisition, human relationships, construction projects

1. Introduction

Projects should have effective and efficient construction material acquisition processes as poor materials sourcing could contribute to substantial delays in construction projects [1]. The mismanagement of building materials has constantly plagued the construction industry, resulting in cost overrun, delays, high levels of construction waste, wasteful project abandonment, climate change, etc. Rahman et al. [2] found that the most important cause of material shortage in Brunei relates to the origin or availability of construction materials. Wuala et al. [3] also revealed that the most significant factors causing delays in Southeast Asia countries (Indonesia, Malaysia, Thailand and Vietnam) relate

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to the contractor (material shortages, improper/ineffective planning, poor site management and supervision, and equipment shortage and failure), and owner-related causes (financial/payment issue and design change/variation order). Koushki et al. [4] studied 450 small, medium, and large private residential projects in Kuwait and found that nearly one-fourth of the total project delays were due to late materials delivery. Kamanga et al. [5] also indicated that among the top ten causes of delay in completing road construction projects in Malawi is the shortage of construction materials. Thus, material acquisition is one of the major elements of managing a construction project, and without proper management, it could lead to cost overrun and delay for the project [6].

The construction project environment is complex and multi-tasks that require excessive collaboration and coordination between individuals who participate in the construction process, which makes the process significantly diversified from the manufacturing process. The involvement of various stakeholders in construction requires proper people management, particularly in the relationship between the different stakeholders. Therefore, it is suggested that fundamental and large-scale reforms in procurement systems, value chain management, and stakeholders' management must be established to overcome construction delays in developing countries effectively. The causes of delay, particularly in relation to material management, should be given attention by client organisations, consultants, and contractors to enable the timely completion of projects. The capability to coordinate and integrate purchasing, shipping, and material control from suppliers is required for material cost control. Three important phases that hold the key to successful materials management are materials purchasing, materials usage, and storage [7]. Another research carried out by Napoleon et al. [8] revealed that planning and monitoring of material schedule, establishing good business relations with suppliers, the use of security measures on-site, use of information communication technology, and use of competent workers as well as practical training of workers is significant for effective material management on construction site and has direct effect on construction project's success. Due to the apparent relationship between human relationships and materials management, this study intends to establish human relationships' impact on material acquisition in construction projects.

2. Material Acquisition

This section highlights the several stages of material acquisition in the construction supply chain, the ways of material acquisition and several improvement strategies from the human relationship perspective that can be incorporated to improve material acquisition in construction.

2.1 Stage 1-Preliminary Planning

Preliminary planning is a crucial stage in construction material acquisition after the contractor has secured the contract. At the preliminary planning stage, the contractor would generally identify materials to be used and estimate the needed materials before any construction material acquisition could be executed. Quantity take-off and cost estimations are the project planning phase's most time-consuming and costly work items. A structure consists of many components, and quantities of all these work items must be computed, and necessary workmanship and materials should be determined. If quantity take-off is computed incorrectly, the cost will also be estimated erroneously. Therefore, the computation of quantity take-off correctly has vital importance. The involvement of the construction team in estimating construction material is important, where early contractor involvement can result in realistic estimates through timely input from subcontractors, material suppliers, and manufacturers, among others. In Pakistan, this would also help control labour costs as most of the construction projects in Pakistan employ labour through subcontractors [9]. Identifying locally available material could also be done during the preliminary planning stage.

According to Adekunle et al. [10], local materials are resources that can be found readily in large quantities at a particular location or area at a certain time. It could also be referred to as material that can be used to fabricate a finished element. However, these materials could be abundant in some areas but unavailable in others. These materials are cheap relative to the imported materials from outside the country. According to Hoxha et al. [11], identifying building materials would influence the robustness and uncertainty of multi-residential buildings. Choosing materials for engineering purposes in the construction industry is a time-consuming and costly process. More than one material is always suitable for engineering applications in the building industry, and the choice of final materials is a compromise option with some benefits and disadvantages [12]. Furthermore, requesting quotations from different suppliers would be carried out. The strategic supplier-related activity of supplier segmentation focuses on evaluating suppliers, identifying different approaches, identifying the most suitable criteria, and using proper methods to segment the suppliers. The main aim of evaluating suppliers is to form different groups from the selected suppliers to create different supplier management strategies for the segments involved [13]. Construction companies also need to establish a construction materials prices database. Sağlam et al. [14] developed a spreadsheet application to compute quantity take-off with minimum human intervention, whereby with this application, quantity take-off and cost are computed fast and accurately with minimised data input. Necessary materials and workmanship are determined using a database, and the cost is estimated using unit prices.

Supplier selection is another strategic decision that significantly influences a firm's competitive advantage. The importance of this decision is amplified when a firm seeks new markets and potentially a new supplier base [13].

Relying on the price of material suppliers is commonly practised by construction companies where long-term relationships and mutual trust are established with an existing construction material supplier. To ensure that construction materials could be delivered to the project site on time, the contractor would generally evaluate the supplier's material delivery capability. As Name et al. [15] stated, supplier evaluation programs and absorptive capacity are both effective means of augmenting the benefits of supplier operational innovativeness. Contrary to theoretical predictions, the benefits of operational innovativeness of suppliers with knowledge-intensive tasks are enhanced through increased absorptive capacity and increased supplier evaluation programs. The important issues related to supplier management include suppliers' capability to deliver on time, long-term contract strategy with suppliers, supplier evaluation, and quality of material from suppliers [16]. Research carried out by Araujo et al. [17] emphasised that the efficiency of suppliers is crucial to the progress and the performance of projects. Furthermore, it is important to utilise criteria and approaches that support consumer interests to select and assess suppliers accordingly. Initiatives for e-commerce deployment in the construction industry are related to establishing business-to-business (B2B) marketplaces, allowing large communities of buyers and suppliers to meet and trade. Buyers of construction materials interact with material suppliers in a marketplace environment, thus striving for the best possible spot buy offer and selecting suppliers based on the lowest price [18]. It is evident in the non-complex situation that the cost of production is well-known on different levels. Several companies must deliver excellent efficiency, the lowest price, and a quick and obvious choice of suppliers. Considering suppliers with a higher price but capable of delivering as scheduled was also an important factor during the preliminary stage. To mitigate supply disruption risks, some manufacturers consider a flexible sourcing strategy, where they can source from multiple suppliers, including regular unreliable suppliers and reliable backup ones [19]. Furthermore, suppliers must be classified according to several specific requirements that meet the needs of a company.

2.2 Stage 2-Confirmation of Procurement

In the next stage, after preliminary planning has been carried out, the contractor must confirm procurement with the construction material suppliers. During this stage, contractors usually negotiate the prices directly with the suppliers. Supplier price and cost analysis have received considerable attention as organisations seek cost savings, a subject central to the esteem of supply management activities in many organisations. It also leads to the effectiveness of organisational commitment to supply management practices, but only if it is done within a competitive background [20]. A material requisition form is a source document the procurement department uses to request materials from suppliers for delivery. The procurement manager usually fills out the materials requisition form and delivers it to the suppliers with the requisition schedule to verify the requested materials' availability. Generally, the contract department will determine the quantities of needed materials and give the exact amounts of construction material to the purchasing department to liaise with the materials supplier.

A particular supplier is selected after inviting quotations or tenders from possible sources of supply and requesting a sample of materials from suppliers. In the next step, after requesting a sample of materials from the suppliers, the contractor must issue the purchase order to the suppliers to ensure construction materials can arrive at the site on time. Purchase orders are an effective tool for businesses to ensure financial expenditures. Without purchase orders, tracking expenses is more difficult and prone to errors and validating delivery reports becomes difficult. In certain cases, especially in large or fast-track projects, site personnel requested materials directly to expedite the project. Ordering an estimated item quantity in bulk has also been practised in getting a competitive price and reducing the cost of transportation. Construction companies cannot recognise their suppliers' strengths and, therefore, rationalise selections dependent on preference for the procurement of content suppliers. To ensure the availability of bulk products, this essential practical commodity supplier sourcing mechanism should be implemented into the supply chain management environment [21]. When ordering bulk materials like fuel, cement, concrete aggregates, or road materials nearing the completion of the project, it is prudent to carefully plan deliveries, ensuring there is only a minimal amount of unused material left on the project. Several sources can also guarantee a consistent supply of bulk materials. Suppose one supplier does something incorrectly, such as a strike, major breakdown, or natural disaster. The other supplier may take the slack and supply all required materials without interruptions [21].

When ordering materials, it is obvious that the correct quantity should be ordered. If the material is imported, it may have to be air-freighted at short notice and at enormous cost. The contractor also practices ordering an estimated quantity per work progress to avoid shortages that will disrupt the work since workers employed with the task must be redeployed to another part of the project. Workers return only when the correct materials are available. The letter requesting the supplier and specifying to the suppliers the exact date to deliver will give information to the supplier when the contractor needs the construction material to arrive at the site to accelerate the process of shipment of the material. This action is very important to avoid an additional cost for the contractor if it runs out of resources and materials. It is also important to advise the suppliers if that requested material needs to be delivered as early as possible or if the company would pay an additional fee for urgent delivery. Purchasing involves acquiring materials of the right quality in the right quantity at a reasonable price and at the right time. Due to that, the contractor purchasing department will purchase the materials from the suppliers with the minimum possible cost. Payment will be made according to the terms specified in the contract. The contractor must follow up on the status of the ordered materials to

ensure the requested material arrives at the site and the construction project can be carried out more efficiently and effectively. The contractor also needs to determine the quantities of delivered material that can be done by site personnel to ensure the ordered material is the same as what was received at the construction site. The delay caused to the project by the shortage of materials makes the contractor appear disorganised and unprofessional.

Research by Ajayi et al. [22] indicates that four characteristics will define the procurement method for material procurement to reduce waste minimisation in building projects. This involves the contribution of manufacturers to zero waste initiatives, low waste procurement control, effective production management of products, and a waste-friendly Bill of Quantity, both of which have a huge effect on waste minimisation. Less than 60% of builders specify in the tender/contract stage how the delivery, storage, and handling of bulk construction materials will be managed. Inspectors identified that uncontrolled risks relating to the delivery, storage, or handling of construction materials remained on almost 10% of worksites where builders had a documented process about these risks. When the suppliers receive the invoices, they are sent for verification to site personnel. After the verification, the purchasing department requests the accounting department to issue payment orders to the suppliers. The main causes of late and non-payment in the Malaysian construction industry are local culture or attitude. Besides that, delays in certification by consultants also contributed to the late and non-payment in the Malaysian construction industry. Meanwhile, Nawi et al. [23] clarified that a suitable payment mechanism would automatically lead to effective integration and collaboration among players to achieve the project goal efficiently.

The quality of construction materials is also one of the key factors contributing to successful final construction products. The construction material selections must be considered at the earlier stages of construction phases to prevent low quality, major defects, and high costs. Currently, there are a lot of material suppliers who refer to a different type of quality system, which will lead to difficulties in assuring the level of construction quality of the final construction products. Therefore, site personnel need to record any problems that arise when they receive construction materials at the site, especially the quality. The inaccurate or unnecessary ordering of products, inventory, insufficient warehousing, rework due to mistakes, improper packaging, ineffective site handling, and ineffective material usage are typical causes of bad material administration. Ordering supplies included waste, wastage, and excess specifications, but sometimes being ignored, but the cost would be included in the overall project amount, payable by the client. This covers purchase and delivery costs, storage and handling, recycling, sorting and return to suppliers, and managing discarded materials Benton et al. [21].

2.3 Stage 3-Delivery and Logistic

During the delivery and logistic stage, site personnel sometimes found defective or non-complying materials during materials inspection. The defective products at suppliers and manufacturers are returned to the upstream members at a lower price than the purchasing price. Defective items may be produced during the regular production up-time because of several reasons such as the deterioration of production processes, imperfect quality of the components, and subassemblies purchased from the suppliers. Inspection is an essential process in the manufacturing system to enhance the outgoing quality of the product. Due to this, the contractor will impose a penalty on the supplier or without penalty, but defective materials will be returned to the suppliers. The supply side is on top of the management agenda in most companies, reflecting increasing strategic attention to benefits that can be gained from cooperation with the suppliers. Partnering has been suggested as the superior solution for making the most of supplier relationships [24].

2.4 Stage 4-Assessment and Updating Database

Progressive organisations tend to optimise supply chains to achieve and maintain a strategic advantage in competitive markets. They must develop relationships, specifically with their supply chain stakeholders and suppliers. The person with whom they form close business ties must also be selective. They need to find the right suppliers who fulfil their unique criteria, have good operating efficiency, and supplement their capabilities to further their market advantage. Therefore, establishing suppliers' record databases for materials becomes very important. The appraisal of suppliers in terms of their environmentally friendly practices and products is split between actual practice and expected response. This limitation is not only in the form of an environmental decision-making system for suppliers but also in measurement and supplier evaluation programmes [25]. Hence, some established contractors would spend an extra cost to conduct a comprehensive assessment of the construction material acquisition.

2.5 Summary of the Stages for Construction Material Acquisition

Table 1 consolidates the four stages of construction material acquisition after the contractor has secured the project.

The capability to coordinate and integrate purchasing, shipping, and material control from suppliers is required for material cost control. Three important phases that hold the key to successful materials management are materials purchasing, materials usage, and storage [7]. Another research carried out by Napoleon et al. [8] revealed that planning and monitoring of material schedule, establishing good business relations with suppliers, the use of security measures on site, use of information communication technology, and use of competent workers as well as effective training of

workers is significant for effective material management on construction site and has a direct effect on construction project delivery success. Therefore, the study concluded that the more material management approaches adopted, the higher the project delivery success. Construction companies were recommended to use more than one material management technique on construction projects to achieve maximum project delivery success.

Table 1 - General stages in construction material acquisition

Code	Stage 1 – Preliminary Planning (After Project Secured)
P1	Construction team involvement in the estimation of construction material.
P2	Using computer applications for estimation.
P3	Identify needed materials to be used.
P4	Estimate the quantity of materials needed.
P5	Define any special-order requirements.
P6	Classify major materials that need to be fabricated.
P7	Identify local available materials.
P8	Request quotations from different suppliers.
P9	Establish construction materials prices database.
P10	Rely on the price of material suppliers.
P11	Rationalise the material prices used in the tender estimation.
P12	Shortlisting the potential suppliers.
P13	Plan for materials requisition schedule.
P14	Evaluate the capability of suppliers' material delivery.
P15	Select suppliers based on the lowest price.
P16	Consider suppliers with higher prices but can deliver as scheduled.
Stage 2 – Confirmation of Procurement	
C1	Negotiate the prices directly with the suppliers.
C2	Obtain materials requisition schedule.
C3	Verify the availability of requested materials.
C4	Determine the quantities of needed materials.
C5	Request samples of materials from suppliers.
C6	Issue purchase orders to the suppliers.
C7	Materials are requested directly by the site personnel.
C8	Order an estimated item quantity in bulk.
C9	Order an estimated quantity as per work progress.
C10	Specify to the suppliers the exact date to deliver.
C11	Purchase the materials from the suppliers.
C12	Follow up on the status of the ordered materials.
C13	Determine the quantities of delivered materials.
Stage 3 – Delivery and Logistics	
D1	Confirmation of received materials at the site.
D2	Inspect the delivered materials at the site.
D3	Issue payment order to the suppliers
D4	Record any problems that arise.
D5	Store the excessive materials for future projects - reuse.
D6	Return defective/noncomplying materials with penalty to suppliers.
D7	Return defective/noncomplying materials without penalty to suppliers.
D8	Sell the excessive construction materials.
D9	Scrap the excessive construction materials.
Stage 4 – Assessment and Updating Database	
A1	Establish suppliers' record database for materials.
A2	Conduct a comprehensive assessment of the construction material acquisition.

2.6 Human Relationship

The success of supply chain relationships is essential in meeting an organisation's priorities. The planning and integration of suppliers' practices and awareness of consumers' expectations contribute to more significant gains for companies. Jraisat et al. [26] define the concept of supply chain management as a framework for creating relationships among the chain members, mainly the exporters and producers, who consider information sharing at three levels of relationship, network, and transaction dimensions to reach the right customer in the right quantity, and at the right time for better export performance.

Naslund et al. [27] noted that it is possible to describe relationships in several ways and provide many main components, including communication and integration among the participants concerned. Trust and knowledge exchange are the most critical issues within these partnerships. Almost all supply chain management structures are driven by problems related to confidence within the supply chain itself. Similarly, a prerequisite for supply chain alignment is not simply recommended for shared agreement between partners; it is a required factor in the partnership to ensure the ultimate effectiveness of cooperation with the organisations concerned. Important interconnected and collaborative partnerships will not and should not be formed for all supply chain stakeholders since long-term engagement between the parties involved is necessary, and corporations exchange sensitive and critical knowledge at this partnership stage.

Trust is also based on evidence confirming the other party's credibility: on-time realisation of past projects, flexibility, and open and frequent exchange of information. Another indicator of inter-organisational trust is mutual trust (relying on reciprocal actions). The level of trust influences the course of inter-organisational cooperation (formation of successful relationships and commitment) [28]. Ultimately, approaches such as formal events, peer recognition, and embedding innovation in a working structure led to a dynamic cultural shift: innovation is aligned with the organisation's overall goals. Rewards and recognition, specifically balancing extrinsic and intrinsic incentives, influence how employees approach their responsibilities.

More significantly, to increase supply chain resilience, administrators of multinational supply chains can adopt maximum communication and enable the exchange of knowledge between their supply chain participants. In global sourcing, buyers need to proactively share information with suppliers by adopting new information technology and having frequent communications to improve supply chain agility. Additionally, suppliers should pursue innovativeness to improve supply chain agility if the firms need to conduct sourcing from global suppliers [29].

Due to new areas and the role of men in all aspects of society, the value of human capital has risen dramatically. It is a rational human being who conducts all the tasks and whose outcomes rely on experience, expertise, ability, and motivation. Logistics professionals must learn to leverage the capacity of human resources management to enact sweeping transformation strategies, not only in their industries but also through their supply and distribution chains in other industries. The effective implementation of IT/IS is highly desirable if a supply chain is responsive and flexible. This requires that business processes be reengineered prior to implementing IT/IS. Investment in knowledge and IT is essential for achieving agility in the supply chain [30]. Apart from that, research by Name et al. [31] has identified that knowledge management is a "bottleneck" in the company's performance.

Knowledge management is particularly important in an organisation as an effective tool for managing knowledge within and between organisations. Knowledge management is an information asset enterprise's practical, systemic management method that helps establish standards, store, distribute, and implement knowledge. To achieve unsustainable effects, the absence of understanding and comprehension also influences actions and behaviour. Successful knowledge management ensures that information and resource movements around the supply chain are aligned within the supply chain management framework. Therefore, identifying the long-term advantages of joint initiatives and specifying the shared gains that can be accomplished are key components in achieving a sustainable supply chain [32].

Research carried out by Diaconu et al. [33] highlighted that without the right people and competencies supporting the development and execution of supply chain processes, nothing could be implemented. An effective measurement system is also a prerequisite because it supports monitoring operational performance. Performance assessment and optimisation experiments must be carried out across the supply chain to gain better supply chain efficiency and get closer to reaching the elusive aim of maximising the supply chain. Both supply chain participants should be active and dedicated to shared priorities, such as consumer loyalty around the supply chain and improved productivity [30]. Suppliers must, therefore, not only implement and promote the principles of non-discrimination within their company but also actively adhere to the principles of non-discrimination in selecting their suppliers and conducting their business relationships.

The consistent findings in the existing knowledge have several implications for human resource management practices. First, culture emphasises that trust and innovation are conducive to knowledge-sharing behaviour and indirectly influence managers' attitudes towards knowledge-sharing. Human resource practices, including fairness in decision-making and open communication, will likely promote an organisational culture that supports knowledge sharing [34]. Long-term relationships in supply chains can generate significant gains for business, development, and the environment by facilitating investment in the supply chain and increasing its sustainability by reducing volatility.

Volatility benefits those advantages lies not in instability but in their ability to capitalise on change, tending to extract high profits while adding little value.

To ensure availability, accountability of the supplier partnership is essential. Companies sometimes provide minimal manufacturing exposure at the retailer's location or outsourced producer. However, firms must look at the whole picture to ensure delivery stays uninterrupted. Typically, procurement negotiates the price, and the order is put by manufacturing inventory handling, distribution decides whom to transport, supply chain controls the shipping, and financing decides when to pay. This fractured supplier management approach contributes to the supply continuity becoming haphazard. The state of each phase is independently monitored, and contextually, there is no way to look at the big picture. A comprehensive collaboration with vendors is needed throughout the company to ensure smooth delivery of high-quality products to the right location at the right moment. Strategic and operational variables are perceived as crucial factors affecting the buyer-supplier partnership; thus, the partnership relationship exerts an impact on supply chain performance. Research carried out by Forsman et al. [35] stated that the current business culture in construction hinders the joinery-products supplier already joining the construction process in the design phase. Therefore, one suggestion would be to improve the standardisation of the interfaces between the actors in the construction supply chain. Chris Blythe (RIBA) said relationships within construction are critical to an industry so easily riven by conflicts. Strong relationships are key to implementing construction material acquisition, and these relationships build over time through experience, trust, understanding, empathy, and respect.

3. Research Method

This study employed the quantitative research approach, where a questionnaire survey was developed in accordance with the variables identified from the literature on human relationships regarding construction material acquisition processes. The questionnaire survey involves two main sections: demographics and variables of human relationships deemed essential for material acquisition. The respondents for this survey were active contractors, registered with CIDB Malaysia under grade G7, limited to managerial positions such as Project Director, General Manager, Senior/Project Manager, Procurement Manager, Contract Manager, Construction Manager, QA/QC Manager, Engineer and Quantity Surveyor. The respondents' designation was limited to this category because in contracting company, generally, the said group of respondents are involved directly with the daily construction activities and have the ability and knowledge on materials acquisition. While their academic qualification was limited from Diploma level up to PhD level, the registry provided the researcher with the name and email address of the G7 Contractor.

The questionnaire was sent to the respondents via email, personal distribution to the contractor's office, WhatsApp application and Google form to 1200 active contractors registered with CIDB Malaysia under grade G7. The respondents were limited to purposive sampling criteria, where 286 valid questionnaires were returned. Subsequently, findings in this research were structured and analysed using descriptive statistical analysis (mean, standard deviation and frequency) with the aid of SPSS24 software. The range of mean values are as follows: 1.00 to 1.80 is categorised as very low level, 1.81 to 2.60 is low level, 2.61 to 3.40 is medium, 3.41 to 4.2 is high level, and 4.21 to 5.00 is very high level.

4. Results and Discussions

4.1 Descriptive Analysis of Human Relationship

In general, all the variables retrieved from the I coincide with the practices in the industry as the mean values hover between 3.50 to 5.00, showcasing a high to very high level of agreement and thus representing the industry's practices and strategies. The highest mean score for human relationships is for item HR1 "long-term relationship - trust, experience and responsiveness," with a mean score of 4.56 and the lowest standard deviation of 0.564. This highlights that on average, the respondents agree that for effective material acquisition management, long-term relationship of trust, experience and responsiveness is most crucial. Meanwhile, the lowest score was for item HR6, "conduct training for suppliers" (mean = 3.46; std. = 1.140), which potentially meant that training for suppliers was the least critical for material acquisition as suppliers would have their own in-house training or the possession of competence without the need for organising such training by the contractors.

Table 2 tabulates human relationships' mean and standard deviation related to the construction material acquisition improvement strategies.

4.2 Frequency Analysis of Human Relationship

The frequency analysis was conducted to analyse the respondents' responses based on the range between strongly disagree, disagree, neutral, agree and strongly agree. The finding shows that most respondents have selected between agree and strongly agree. Thus, the representation considers only the agree and strongly agree. The results for human relationship show that items HR1 (long-term relationship – trust, experience, and responsiveness) attained 96.5% (275), HR13 (clearly understand the client's needs and objectives) received 95.8% (273), HR10 (establish strategic partnership with suppliers) scored 93.7% (267), HR11 (strategic partnership with distributors) gained 93.0% (265) and

HR5 (long term and needs resources commitment) clinched 91.6% (261) each. The top three highest-voted variables were aligned with the previous mean analysis results that reinforced the importance and criticality of long-term relationships, a clear understanding of client’s needs, and strategic partnerships with suppliers. The result was in line with the research carried out by Ryciuk et al. [28], who mentioned that the level of trust influences the course of inter-organisational cooperation (formation of successful relationships and commitment). Long-term relationships in supply chains can generate significant gains for business, development, and the environment by facilitating investment in the supply chain and increasing its sustainability through reducing volatility. The importance of strategic supplier partnership in supply chain management of manufacturing companies in Malaysia in enhancing their products’ quality and business performance. The result indicates that construction companies should also emphasise and provide greater attention to the aspects of construction materials acquisition and attain support from the management for strategic supplier partnerships in supply chain management programs to enhance construction projects’ performances.

Meanwhile, the lowest frequency on the human relationship list was item HR6 (conduct training for suppliers) which obtained 47.7% (136), followed by item HR15 (establish a champion in each party to drive relationship forward) acquired 84.9% (242), HR7 (rationalisation of existing suppliers) secured 85.3% (243), HR8 (set up review mechanisms for feedback, ideas and knowledge exchange) captured 87.7% (250) and item HR16 (improved team selection and relationship) received only 89.1% (254) respondents who agreed and strongly agreed that the human relationship variables were important for construction material acquisition.

Table 3 tabulates the frequency analysis of human relationships related to the construction material acquisition improvement strategies.

Table 2 - Mean and standard deviation of human relationship

Item	Human Relationship	Mean	Standard Deviation	Rank
HR1	Long-term relationship – trust, experience and responsiveness.	4.56	0.564	1
HR13	Clearly understand the client’s needs and objectives.	4.52	0.579	2
HR10	Establish a strategic partnership with suppliers.	4.40	0.618	3
HR4	Knowledge asset in construction material acquisition.	4.37	0.667	4
HR2	Rewarding creativity, facilitating the development and application of new ideas.	4.36	0.677	5
HR18	Encourage problem-solving with the supply partners.	4.35	0.694	6
HR12	Enhance a partnership with existing suppliers.	4.35	0.678	7
HR11	Strategic partnership with distributors.	4.35	0.657	8
HR16	Improved team selection and relationship.	4.34	0.666	9
HR9	Potentially beneficial effects of the long-term trust value.	4.34	0.654	10
HR5	Long-term and needs resources commitment.	4.33	0.647	11
HR17	Encourage teamwork with the supply chain partners.	4.32	0.670	12
HR3	Resources development in construction material acquisition.	4.30	0.665	13
HR14	Active participation of suppliers during the construction phase.	4.26	0.698	14
HR7	Rationalisation of existing suppliers.	4.20	0.717	15
HR8	Set up review mechanisms for feedback, ideas and knowledge exchange.	4.20	0.724	16
HR15	Establish a champion in each party to drive the relationship forward.	4.16	0.725	17
HR6	Conduct training for suppliers.	3.46	1.140	18

Table 3 - Frequency analysis for human relationships

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	%	%	%	%	%
HR1. Long-term relationship - trust, experience and responsiveness.	0.00	0.00	3.51	37.19	59.30
HR2. Reward creativity, encouraging development and implementation of new ideas.	0.00	0.70	9.12	43.16	47.02
HR3. Resources development in the materials supply chain.	0.00	0.70	9.47	49.12	40.70
HR4. Knowledge asset in the materials supply chain.	0.00	1.05	7.37	45.26	46.32
HR5. Long-term and needs resources commitment.	0.00	0.70	7.72	49.47	42.11
HR6. Conduct training for suppliers.	3.86	17.19	31.23	24.21	23.51
HR7. Rationalisation of existing suppliers.	0.00	1.40	13.33	48.77	36.49
HR8. Set up review mechanisms for feedback, ideas and knowledge exchange.	0.35	1.05	12.98	49.82	35.79
HR9. Potentially beneficial effects of long-term trust value.	0.00	0.35	8.77	47.37	43.51
HR10. Establish strategic partnerships with suppliers.	0.00	0.35	5.96	47.02	46.67
HR11. Strategic partnership with distributors.	0.35	0.70	5.96	49.82	43.16
HR12. Enhance a partnership with existing suppliers.	0.35	0.35	8.42	45.96	44.91
HR13. Clearly understand the client's needs and objectives.	0.00	0.00	4.21	40.00	55.79
HR14. Active participation of suppliers during the construction phase.	0.35	1.75	7.37	52.98	37.54
HR15. Establish a champion in each party to drive the relationship forward.	0.00	2.11	12.98	51.23	33.68
HR16. Improved team selection and relationship.	0.00	0.00	10.88	44.21	44.91
HR17. Encourage teamwork with the supply chain partners.	0.35	0.35	8.42	49.12	41.75
HR18. Encourage problem-solving with the supply partners.	0.35	0.70	8.42	44.56	45.96

5. Conclusion

This study aimed to establish the improvement strategies for construction material acquisition from the human relationship perspective. In general, the respondents have agreed on the variables retrieved from the literature with different levels of importance across the eighteen identified variables. The human relationship was critical to improving construction material acquisition; hence, addressing critical issues including long-term relationships such as trust, experience, and responsiveness, clearly understanding the client's needs and objectives and establishing a strategic partnership with were the most important factors to be considered by construction companies to remain competitive and

sustainable with regards to material acquisition management. Findings from this study on the influence of human relationships on material acquisition in construction projects can be used as a guide to enhance the construction material acquisition approach for contractors undertaking projects in Malaysia.

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