

Research article

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Factors affecting the cooperative relationships in material supply chain of construction enterprises

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Abstract: The materials supply chain in the construction industry involves many independent actors, creating complex, dependent relationships, including competitive and cooperative relationships. To develop together, chain members need to build a long-term cooperative relationship for mutual benefits, promote the development of chain members and improve the operational efficiency of the construction supply chain. Therefore, studies to measure and improve this relationship are urgently needed. Within the scope of the present article, the authors carry out work with the aim of assessing the current status of the relationship between construction contractors and partners in their material supply chain and ranking the factors affecting the relationship. From the synthesis of research documents, the report outlines eight factors affecting the construction supply chain cooperation, namely: trust, information sharing, choosing the right partner, profit and risk sharing, senior management support, problem solving, transaction frequency and culture of cooperation. A survey was carried out with subjects who are senior leaders of construction enterprises, project directors/deputy directors, site commanders/deputy commanders, employees of different departments, contractors and field engineers. Data from 132 valid questionnaires were used for the study. Based on the survey results, the authors assessed the current relationship with the members in the supply chain and the impact of these factors on the cooperation between construction enterprises and their supply chain partners.

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The research results of the present article can help construction enterprises identify important influencing factors and take appropriate measures so as to strengthen the cooperative relationships with the stakeholders. This would help improve the operational efficiency of the supply chain.

Keywords: cooperative relationships, material supply chain, supply chain, construction enterprises, factors affecting, Vietnam

1 Introduction

In recent years, Vietnam's construction industry has been experiencing difficulties in development due to the impact of the economic recession. Construction businesses face increasingly stiff competition from domestic rivals as well as from the participation of foreign enterprises, while customers demand products of higher quality, shorter lead times and lower costs. It is difficult for construction enterprises to compete and surpass competitors only by the capacity of one enterprise; so, businesses aim to find partners to form supply networks. In such instances, competition is no longer competition between independent businesses, but competition between supply chains. This is considered an appropriate strategic method, meeting the development needs of the current construction industry (Akintoye et al. 2000). Recently, the construction sector has also realised how important supply chain management is for enhancing productivity (O'Brien et al. 2009). An efficient supply chain will minimise risks, ensure the timely supply of materials, maintain construction progress and the quality of construction works, and bring in customer satisfaction at the lowest cost. However, due to the characteristics of the construction industry, the application of the construction supply chain in practice has faced many difficulties and has not achieved as much success as other manufacturing industries. One of these difficulties is that the construction supply chain has many

participants and this creates complex, dependent relationships (Kania et al. 2021).

In particular, in the supply chain of construction contractors, there are many members involved. The construction process requires a variety of materials, and the contractor may have to work with many separate material suppliers. These members may come from different independent organisations and have their own interests; hence, there is always conflict in the chain. The customer wants the best-quality work at the lowest cost, the main/subcontractor wants to maximise profits, while the material supplier wants high profit and on-time payment. Resolving conflicts, harmonising interests between the parties and aiming for common interests will help the construction contractor's material supply chain, in particular, and the supply chain in the construction industry, in general, operate effectively.

Therefore, building and developing cooperative relationships between chain members is essential, because supply chain cooperation not only addresses how chain members share responsibilities and benefits derived from improving mutual benefits, but also address management inflexibility (Sường 2012).

The cooperation in the supply chain aims at long-term and sustainable cooperation, exploiting the strengths of each party in the fields of operation. At the same time, research helps find effective directions to ensure the optimal efficiency for each party's business activities, as well as bring the best use value to customers.

For construction enterprises, with the cooperation of the supply chain operating effectively, it will bring a number of benefits to businesses: ensuring the construction schedule; guaranteeing the quality of work; minimising waste due to efficient material management and control; reducing costs and increasing profits; and bringing satisfaction to customers. Thereby, these positive aspects will increase competitiveness between enterprises in the same industry and thus, create long-term cooperation relationships to help businesses turn reputable and attract more customers. Through cooperation, helping members with the same function in the chain will help increase competitiveness (cross-linking), thereby raising their position.

Next, strong supply chain relationships will help the construction industry promote the development of businesses and improve the performance of construction activities. Good industry supply chain cooperation will help the industry improve its competitive position and go into sustainable and effective development. Members in the supply chain cooperate closely on work assignment

and fully exploit the advantages of each member in the supply chain, through, the construction industry will increase operational efficiency and gradually participating deeply in the global chain (Sường 2012).

Thus, it can be seen that cooperation in the construction supply chain plays a great role in the development of construction enterprises and promotes the development of the construction industry. Research on this topic serving as a basis to help businesses build cooperative relationships is very necessary. However, in Vietnam, there is currently no research on this topic. Therefore, the authors decided to conduct a study on the relationship between the members of the material supply chain of construction contractors.

2 Literature reviews

2.1 Cooperation in the supply chain

Collaboration is the process by which two or more people, entities or organisations work together to accomplish a task or achieve a goal (Martinez-Moyano 2006).

According to the Construction Industry Institute (CII, 2012), supply chain partnering is 'a long-term commitment (or can be applied over shorter periods of time such as project duration) between two or more organisations such as in an alliance to achieve specific objectives by maximizing the resource efficiency of each participant' (M. Venselaar et al.2015).

A collaborative supply chain simply means that two or more independent companies work together to plan and execute supply chain operations with greater stability than when operating independently (Simatupang and Sridharan 2002). This mode of action can bring significant benefits and advantages to its partners (Cao and Zhang 2011). It has become known as a collaborative strategy wherein one or more companies or business units work together to create mutual benefit (Simatupang and Sridharan 2008).

According to Ralston (2014), it is recognised that cooperation in the supply chain is a long-term link between participants, sharing information and working together in a common plan to increase the efficiency of the chain when realising business goals. Collaboration in the supply chain will leverage the expertise and skills of individual companies to jointly benefit the end consumer (Fawcett et al. 2008). The goal of collaboration is for the parties to work collaboratively to devise and implement

better methods to solve problems and deliver the value that customers expect.

These partnerships are long-term efforts in which partners know each other's capabilities and needs and actively seek to develop new or improved practices. Studies of relationships between chain members confirm that this is a long-term 'partnership' (Xue et al. 2007; Cox 2009; King and Pitt 2009; Benton and McHenry 2010; Meng 2010; Othman and Abd Rahman 2010; Samarasinghe 2014; Hesami and Navab 2015).

Thus, supply chain cooperation can be defined as cooperation between independent but related companies to share resources and capabilities to meet the most unique or changing needs of customers (Simatupang and Sridharan 2008).

2.2 Relationships in the construction supply chain

2.2.1 Level of supply chain collaboration

According to Meng (2010), relationships in construction supply chains are described in four levels from one level: the first level is traditional adversarial relationships, the second level is the transition from traditional to cooperative, the third level is short-term cooperation and the fourth level is long-term cooperation. Degree 1: the relationship between project participants is dominated by a win-lose mentality without alignment for the common goal. The parties are only interested in pursuing their own goals and maximising their own profits, not with influence with other members; relationships at level 2 are characterised by a very limited level of cooperation. The parties focus on their own goals and interests without being able to have common goals. However, the benefit to both parties allows both parties to work together to a limited extent. Trust is primarily built on a mutual understanding of each other's ability to perform tasks; Relationships at level 3 are characterised by short-term cooperation. Partners are selected for each specific project; the goals are agreed in a single project. Every party is aware that their own interests will be best met by focusing on the overall success of the project. The win-win philosophy is the foundation of setting and achieving common goals. The partners work together as an integrated project team. Goodwill beliefs began to appear in the project; Relationships at level 4 are characterised by long-term cooperation. It is represented by strategic partners or strategic alliances. The objectives are aligned with a wide range of projects. Fair benefits

and shared risk ensure that all partners work most closely throughout the entire supply chain. Every party is committed to achieving the best value. Performance is continuously improved through learning and innovation. The belief of goodwill is ingrained in the minds of every member who works together. Partners benefit from a stable relationship maintained over a lengthy period.

In the same study of the extent of supply chain collaboration, Trent (2005) and Benton and McHenry (2010) looked at the aspects of the partnership: ineffective relationships (lose-lose), competition (win-lose), collaboration, and cooperation (win-win). Counterproductive, lose-lose relationships are relationships in which each party is so focused on getting the best for itself that each party is at a disadvantage. This relationship is undesirable because it does not promote positive relationships between stakeholders, and neither party achieves its goals. This discourages future cooperation between the parties; A competitive relationship (competitive, win-lose) is one in which the parties try to achieve the best possible outcome in their negotiations and do not see the benefit of both parties achieving a common goal. In this relationship, suppliers can easily be replaced at any time. Cooperative relationships recognise the potential value of both parties getting what they want and maximising the potential for a long-term relationship. Despite this, it remains a partnership that lacks the necessary teamwork between parties to optimise benefits for all members of the supply chain; Collaborative, win-win relationship: When collaborating, parties truly realise the benefits of working together to optimise the outcome of the chain. The parties work together to develop a strategy aimed at delivering a high-quality project, on time and minimising costs.

The relationship between the parties in the supply chain, or in terms of buyers and suppliers, can be in four styles (Cox 2009): First, the opposite long-arm – one side wants to maximise its share; second, the long-sleeved side is not antagonistic – the two sides accept the current market price without engaging in active bargaining; third, adversarial partnerships – two sides cooperate for a long time, but one seeks to maximise commercial benefits; Fourth, cooperation is not adversarial – the two sides cooperate and share relatively similar commercial value.

From these four options in the buyer-supplier relationship, it is clear that win-win results based on a non-adversarial way of working collaboratively are always the most appropriate. The win-win approach has shown that participants firmly believe that when both parties express interest in each other's interests, both financial and non-financial interests are in interest. An increase in

common interests can be accomplished by multiple parties who share a common goal. Also, ‘win – win’ creates a strong motivation for all parties to achieve common goals (Cox and Ireland 2002; Cox 2004a, b; Cox et al. 2006).

2.2.2 Types of collaboration in the supply chain

According to Simatupang and Sridharan (2002) on supply chain collaboration, both experts suggest that there are basically three types of cooperation:

Vertical collaboration: A collaboration when two or more organisations at different levels or stages of the chain work together, sharing responsibilities, resources and information to serve the end customer. A vertical link chain connects the first supplier in several ways to the end customer. Vertical alignment has always been directed at both the business-to-supplier relationship and the business-to-end customer (Christopher 2011). Vertically linked supply chain structure is shown in Figure 1.

Horizontal collaboration: This occurs when two or more organisations with the same function at the same level or stage in the supply chain work together, sharing information or resources. Thus, horizontal cooperation helps organisations with the same function minimise losses and increase benefits.

Lateral collaboration: The aim is to gain more flexibility through competition and capacity-sharing in both vertical and horizontal cooperation.

2.3 Factors affecting the relationship of employees in the supply chain

The authors looked at studies on the factors influencing construction supply chain relationships by different researchers over different time periods. Meng (2010) identifies 18 criteria that affect the success of supply chain relationships, including: trust, shared goals, teamwork, risk allocation, communication, continuous improvement, business attitude, problem solving, etc. procurement systems, senior management engagement, information-sharing, mid-term (long-term or short-term), change flexibility, lack of experience collaboration, incentives, performance evaluation, transparency, and monitoring.

After in-depth research, the results show that eight influencing factors are: choosing the right partner, common goals, trust, cooperation, information sharing, problem solving, risk allocation, and continuous improvement.

Benton and McHenry (2010) identified the factors influencing supply partnerships in the four phases of chain application. These factors are: trust, profit and risk sharing, communication/transaction frequency, attitude/goodwill to cooperate, conflict resolution, flexibility, cultural compatibility, procedures, partner capacity, information systems, and management compatibility.

According to Akintoye et al. (2000), Samarasinghe (2014) and Hesami and Navab (2015), the key factors in building supply chain relationships effectively includes: integrated information systems, trust/credibility, reliability of supply, leadership support, sharing of risks and benefits, sharing of information, planning business planning, close linkage between supply and demand, human resource development and communication/transaction frequency.

King and Pitt (2009) identify eight factors that help develop a long-term relationship, including: trust, communication/frequency of transactions, interdependence, cooperation, commitment of leadership, flexibility/flexibility, caring for each other’s interests, integrity and honesty.

The factor influencing ‘collaborative culture’ has not been included in studies (Akintoye et al. 2000; Samarasinghe 2014; Hesami and Navab 2015). However, studies on supply chain cooperation in industrial production industries in Vietnam show that the cultural element of cooperation is highly appreciated, as in studies by Sương (2012) and Trang (2017). There is currently no research on factors affecting supply chain relationships in construction in Vietnam. Therefore, the authors included the factor of ‘collaborative culture’ in the study to assess the impact on cooperation in the context of Vietnam’s construction.

Through the results of published research works and discussions with experts, the authors included in the study eight factors affecting the cooperation relationship of members in the construction supply chain:

- (1) Trust between supply chain members (Akintoye et al. 2000; King and Pitt 2009; Benton and McHenry 2010;



Fig. 1: Vertically linked supply chain structure (Bäckstrand 2007).

- Meng 2010; Samarasinghe 2014; Hesami and Navab 2015)
- (2) Communication/trading frequency (Akintoye et al. 2000; King and Pitt 2009; Benton and McHenry 2010; Meng 2010; Samarasinghe 2014; Hesami and Navab 2015)
 - (3) Information sharing (Akintoye et al. 2000; Benton and McHenry 2010; Meng 2010; Samarasinghe 2014; Hesami and Navab 2015)
 - (4) Collaborative culture (King and Pitt 2009; Benton and McHenry 2010; Meng 2010)
 - (5) Senior leadership commitment (Akintoye et al. 2000; King and Pitt 2009; Samarasinghe 2014; Hesami and Navab 2015)
 - (6) Choosing the right partner (Akintoye et al. 2000; Benton and McHenry 2010; Meng 2010; Samarasinghe 2014; Hesami and Navab 2015)
 - (7) Risk and benefit sharing (Akintoye et al. 2000; Benton and McHenry 2010; Meng 2010; Samarasinghe 2014; Hesami and Navab 2015)
 - (8) Problem solving (King and Pitt 2009; Benton and McHenry 2010; Meng 2010).

2.3.1 Trust between members of the supply chain

A successful relationship is characterised by mutual trust. When chain members have mutual trust, they generate profits, serve customers better and are more adaptable (Corbett et al. 1999).

According to Mentzer et al. (2000), trust in a partner is an expression of trust. Credibility is gained through the process of interaction between the members of the supply chain. Studies have shown that the benefits derived from credibility such as minimising costs of administrative procedures and other barriers help the flow of materials, finance, products and information faster in the chain, leading to improved chain performance.

Trust motivates chain members to work together on decision-making and problem-solving (Fawcett et al. 2008). The emergence of trust can improve success rates in supply chain collaboration.

2.3.2 Trading frequency

The primary frequency (Sường 2012) is how often that refers to how often a transaction occurs. Success in the customer–supplier relationship depends on how often the partners interact (Sahay 2003). There is no one universal rule to decide how often partners should interact. More transactions lead to greater interaction and thus shape

a closer relationship and ensure a smoother transaction (Cooper et al. 1997).

2.3.3 Information sharing

Information sharing refers to the exchange of important, often exclusive, information between supply chain members through means of communication such as face-to-face meetings, telephone, fax, mail and the Internet (Hudnurkar et al. 2014).

Information sharing allows chain members to capture, store and provide the information needed to ensure effective decision-making (Simatupang and Sridharan 2002). Chain members can obtain sufficient information to monitor and control the progress of each stage of implementation in the supply chain. Advanced information technology such as decision support systems, enterprise resource planning and the Internet can be used to transmit up-to-date data on demand planning, product movement, workflow, cost and performance status.

Information sharing acts as a glue that combines other elements of cooperation into one whole. Based on the information shared, chain members are better able to make decisions and take actions on the basis of clearer visibility. Therefore, information sharing often facilitates decision synchronisation through the provision of relevant, timely and accurate information needed to make effective decisions about supply chain planning and execution (Simatupang and Sridharan 2008).

2.3.4 Collaborative culture

Collaboration is the set of specific capabilities, willingness and awareness of the business in collaboration with partners to provide customer-oriented solutions (Sường 2012). Chain members must have a cheerful outlook towards working together. Owing to a positive cooperative attitude, work is done more smoothly and smoothly, chain members create close connections, trust and respect for stakeholders.

The culture of cooperation is considered in the following aspects (Meng 2010): (1) Working relationship: the type of working relationship that exists between parties, e.g. confrontation, collaboration, or cooperation; (2) A culture of blame or problem-solving; and (3) Mutual support: whether members provide support when one party is struggling.

According to Kumar et al. (2016), a collaborative culture has an impact on supply chain performance and plays a leading role in successful collaborative relationships. A culture of cooperation strongly promotes

relationships and is a factor that enhances long-term cooperative activities.

2.3.5 Senior leadership engagement

Cohesion and support from senior management has always been a prerequisite for supply chain collaboration (Chan et al. 2004). Without commitment from the senior management, it is impossible to achieve the overall goals of the chain. The commitment of senior leaders creates a conducive environment for activities inside the organisation and links with other members of the chain, demonstrating their goodwill and responsibility for the operation in the chain.

Senior leadership of chain members must consider the partnership as a common development strategy and fully implement the commitment to create mutual trust that will act in the mutual interest of the parties (Hudnurkar et al. 2014).

2.3.6 Choosing the right partner

Has the construction enterprise selected the partner that best meets the set criteria? The criteria for selecting suppliers can be low price, quality of goods, on-time delivery, simple ordering procedures, capacity/supply of partners to ensure reliability etc.

Enterprises select suitable suppliers for the purpose of participating in their supply chain. Only suitable suppliers become strategic partners that are retained in businesses to build long-term relationships.

2.3.7 Risk sharing and return sharing factor

The risk and return sharing factor is considered in the following aspects (Meng 2010): willingness to share risks and benefits among supply chain participants; principles of fairness, rationality and transparency in allocating risks and benefits to supply chain participants.

2.3.8 Problem solving

The problem-solving factor is considered in the following aspects (Meng 2010): (1) chain participants provide early warning of possible problems during cooperation and construction activities, and even warning of possible problems for the first time; (2) the effectiveness of problem solving in the process of cooperation is reflected in the quick, timely and minimally damaging solution; (3)

taking measures to avoid repetition of similar problems; and (4) the flexibility to adapt to changes in the cooperation process.

3 Research methodology

The study aims to determine the current state of the relationship between members of the construction supply chain and assess the impact of influencing factors in the supply chain cooperation of construction enterprises.

Survey subjects: Those who are working at construction enterprises.

Scope of the survey: The authors met and provided the survey directly to each pre-determined interviewer, working in Hanoi for them to read, research independently and follow the requirements. The slip is withdrawn the next day (according to the agreed schedule). In addition, the authors called to interview directly the surveyed subjects and also sent the survey form designed in the form of a questionnaire based on Google forms electronically to the surveyed subjects in localities throughout the country.

The survey is conducted through the following steps:

3.1 Design the questionnaire

Based on an overview of existing studies and after interviews with some functional department leaders and project leaders, the authors developed a preliminary questionnaire.

3.2 Select and edit questions based on expert input

Contents of the questionnaire:

Part 1: General information. This section consists of four multiple-choice questions, in order to collect general information of the subject in question and classify the subject.

Part 2: Content about the current state of relationships and factors affecting the cooperation relationship in the supply chain of construction enterprises. This section is divided into six questions consisting of multiple-choice and assessment questions, intended to gather information on:

- (1) Have construction enterprises approached supply chain management or not?
- (2) How do construction enterprises maintain relationships with customers?

- (3) How do construction enterprises maintain relationships with suppliers?
- (4) Evaluate the relationship of construction enterprises with partners?
- (5) Evaluate the role of the partnership in the supply chain management success of the construction enterprise.
- (6) Assess the impact of factors affecting the overall relationship of supply chain members.

3.3 Edit and complete the questionnaire; proceed to send the official questionnaire

The questionnaire is sent to experts (senior leaders of construction enterprises, project managers), site commanders, staff of contractors' departments and field engineers. The total number of survey questionnaires sent to survey subjects was 150 votes.

The total number of responses obtained was 132 satisfactory votes. The results are shown in Table 1.

In the problems included in the questionnaire, the number of independent variables was eight. The minimum number of samples required is: $n > 50 + 8 \times 8 = 114$ (Hair et al. 2014). The number of survey votes collected was 132 votes thus, ensuring the number of sample size; hence, the survey results were statistically significant.

3.4 Data processing

Data processing method:

- For multiple-choice questions, the authors calculate the percentage (%) of people who choose the answer option/the total number of survey participants.
- For the level assessment questions, the authors use The Relative Importance Index (RII) method to measure the importance of influencing factors in supply chain cooperation based on surveys that collect the necessary data.

The RII method uses an ordinal scale from 1 to 5 to determine the degree of impact of each factor: (1) Very unimportant; (2) It doesn't matter; (3) Normal; (4) Important; (5) Very important.

To analyse the degree of impact, the RII method uses the following formula (Patil and Adavi 2012):

$$RII = \frac{\sum_{i=1}^5 W_i \times X_i}{\sum_{i=1}^5 X_i} \quad (1)$$

Tab. 1: Summarisation of the number of satisfactory surveys.

Method	Meet in person	Make a call	Via the form Google forms	Sum	
				Ticket	Rate (%)
Valid votes	25	20	87	132	88
Number of votes submitted	25	20	105	150	100

(Source: Authors).

Wi: Assess the importance on a scale of 1 to 5 of the surveyor.

Xi is the number of surveyors who choose the i-th scale; i is the ordinal scale from 1 to 5.

4 Analysis and discussion of results

4.1 General information

Questions 1–4 relate to the basic information of construction enterprises. This is essential to attract more survey participants and help the author team ensure that respondents come from the right field in which the author team is conducting the survey.

- The first question is about the working positions of the survey participants. The results received about the number of working positions of the survey participants corresponding to the percentage (%) are shown in Figure 2.

Among the 132 respondents, there were 9 senior leaders of construction enterprises (6.8%); 6 directors/deputy directors of construction investment projects (4.5%); 6 site commanders (4.5%); 18 field engineers (13.6%); and 93 departmental employees (70.5%).

The authors made efforts to distribute the survey to a variety of respondents, but field engineers and employees of functional departments/departments of construction enterprises participating in the survey were the most numerous. This is the most accessible audience group.

- Regarding work experience: 5 people >20 years of experience (3.79%); 27 people with >10–20 years (20.45%); 61 had experience >5–10 years (46.21%) and 39 had experience no more than 5 years (29.55%). The results showed that the survey participants were those who had work experience in the construction sector, mainly those who had worked for 5–10 years (Figure 3).

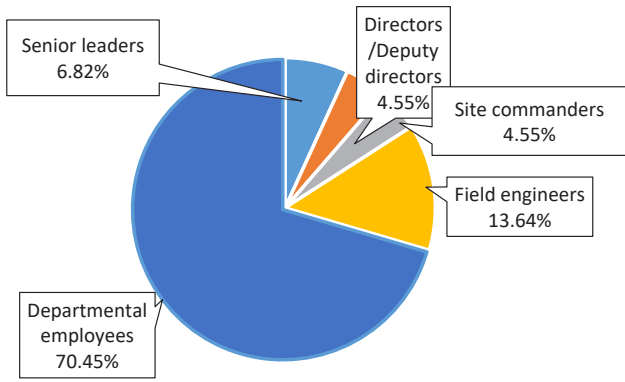


Fig. 2: Map of the working position of the surveyor. (Source: Authors).

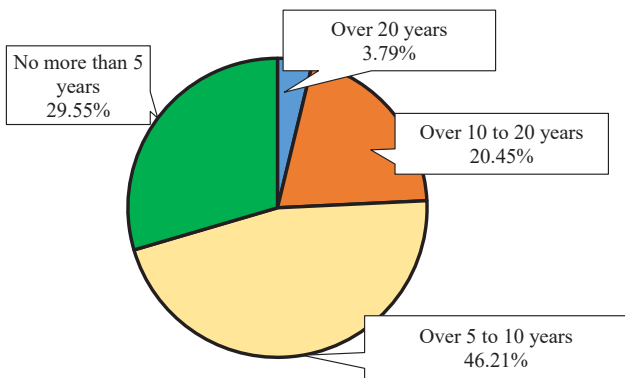


Fig. 3: The chart shows the work experience of the survey participants. (Source: Authors).

Tab. 2: Number of survey participants corresponding to enterprise size.

Enterprise size	Number of employees	Number of respondents	Percentage (%)
Large	Over 200 employees	24	18.18
Medium	From 101 to 200 workers	45	34.09
Small	From 11 to 100 employees	54	40.91
Micro	No more than 10 employees	9	6.82
Sum		132	100

(Source: Authors).

- In terms of the scale of the construction enterprises, the results are shown in Table 2. Data show that the number of survey participants is mainly from small- and medium-sized construction enterprises. The number of people from micro and large enterprises also participated in this survey, but the number was smaller.

- For the project scale, the data obtained are as follows: In total, 37 people were found participating in large projects over 200 billion Vietnamese currency unit (VND) (28.03%); 52 participants in medium projects from over 50 to 200 billion VND (39.39%); and 43 participants in small projects from over 3 to 50 billion VND (32.58%). Among the survey participants, no one worked on micro-projects below 3 billion VND. The above figures show that the projects that the respondents have been seen implementing are mainly small- and medium-sized projects.
- The survey results of the first four questions showed that the survey participants were all people working in the field of construction. The majority of those surveyed have >5 years of experience, and they mainly come from small- and medium-sized enterprises.

4.2 Analysis of the material supply chain cooperation relationship of construction enterprises

4.2.1 Have construction enterprises approached supply chain management?

To the question of whether your construction enterprises has access to the supply chain, the results are shown in Table 3 and Figure 4.

The results showed that large-scale, medium-sized construction enterprises and some small enterprises approached supply chain management (with 93 votes corresponding to 70.45%); Micro-enterprises still manage in the traditional way, 29.55%.

4.2.2 How do construction enterprises maintain relationships with customers?

In the matter of maintaining relationships with customers (investors), many respondents said that construction enterprises maintain long-term partnerships with customers (28%). Some people (32.6%) said that construction enterprises often change customers according to different projects, and the other option is 39.4% (Figure 5). Each construction enterprise will make a decision suitable to the specific situation. Investors (customers) can be professional people in the field of construction or can also be people/agencies who only invest in building the project once. In this case, the construction enterprise will cooperate with the new customer/investor according to each project. At the same time, construction enterprises

Tab. 3: Survey results of construction enterprises having approached supply chain management.

	Surveyors from large construction enterprises	Surveyor from medium construction enterprise	Surveyor from small construction enterprise	Surveyor from micro construction enterprise	Sum	
					Person	%
Reached	24	43	26	0	93	70.45
Not yet reached	0	2	28	9	39	29.55
Sum	24	45	54	9	132	100

(Source: Authors).

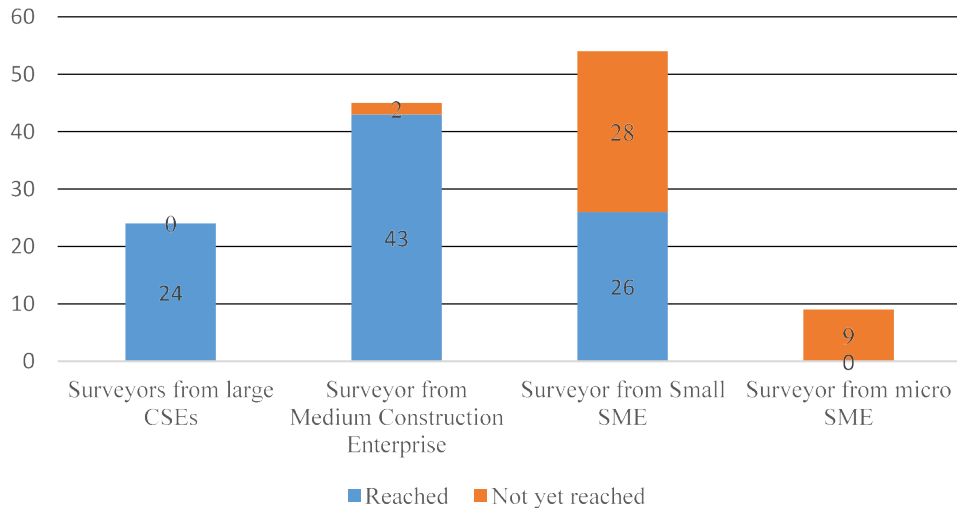


Fig. 4: The chart shows the proportion of surveyors' construction enterprises that have approached the supply chain. (Source: Authors).

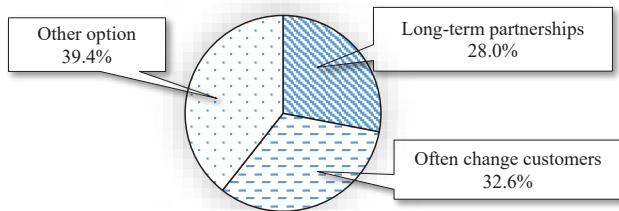


Fig. 5: The chart shows how to maintain relationships with customers of construction enterprises. (Source: Authors).

maintain long-established relationships with investors operating in the field of construction.

4.2.3 How do construction enterprises maintain relationships with material suppliers?

The survey results obtained the following data: 79 votes (61.4%) said that construction enterprises maintain long-term relationships with material suppliers; 23 votes (17.4%) said that construction enterprises will often change material suppliers according to each project; 28 votes (21.2%) said the combined construction business

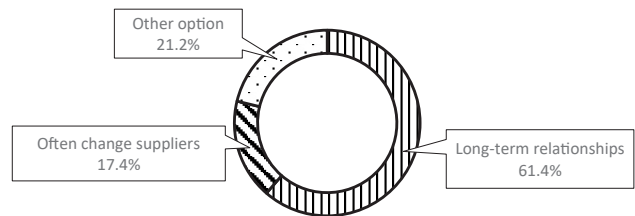


Fig. 6: The chart shows how to maintain relationships with material suppliers of construction enterprises. (Source: Authors).

both maintained relationships with some strategic material suppliers and changed some material suppliers according to projects. Thus, most construction enterprises still prioritise choosing suppliers who have had previous cooperation rather than changing new material suppliers (Figure 6).

4.2.4 Relationship of construction enterprises with partners

The surveyor rated the relationship of their business with partners according to the following levels: very bad, not good, normal, good and very good.

According to the results, the majority of the respondents said that their businesses always maintained good relationships with their partners (53.27%) and was sometimes very good at 18.94%. Thus, it can be seen that construction enterprises have focused on maintaining good relationships with partners. The results are shown in Table 4 and Figure 7.

Tab. 4: The surveyor evaluated the relationship of the construction enterprise with partners.

	Very bad	Wrong	Normal	Good	Very good	Sum
Number of votes	2	5	31	69	25	132
Percentage (%)	1.52	3.79	23.48	52.27	18.94	100

(Source: Authors).

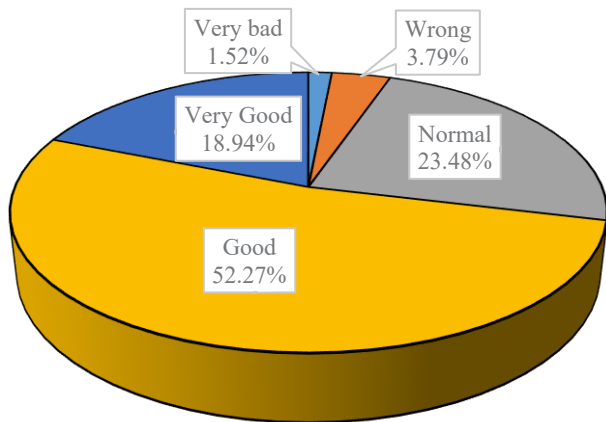


Fig. 7: The chart shows the business's relationship with partners. (Source: Authors).

4.2.5 Evaluate the role of partnership in the supply chain management and the success of the construction enterprise

The assessment of the respondents about the importance of partnership to the success of supply chain management and the construction enterprises is vital. This helps build relationships in the supply chain of construction enterprises.

The answers are all classified into five levels, corresponding to (1) Very unimportant, (2) Not important; (3) Normal; (4) Important and (5) Very important. The results are shown in Figure 8:

The results show that a partnership is important (47.73%) and very important (43.18%) to supply chain management success.

4.2.6 Assess the impact of factors affecting the cooperation of supply chain members

In terms of assessing the impact of factors affecting the relationship between members of the supply chain, the answers were also classified into five levels, corresponding to (1) Very unimportant; (2) It doesn't matter; (3) Normal; (4) Important and (5) Very important. Based on the survey data obtained, the authors calculate the percentage (%) of votes for each evaluation level out of the total number of surveys for content and then calculate the RII relative correlation index according to formula (1). The results of the analysis are shown in Table 5 and Figure 9.

From the above results, we see that the factors included in the questionnaire were assessed by the survey subjects as important and very important. In particular,

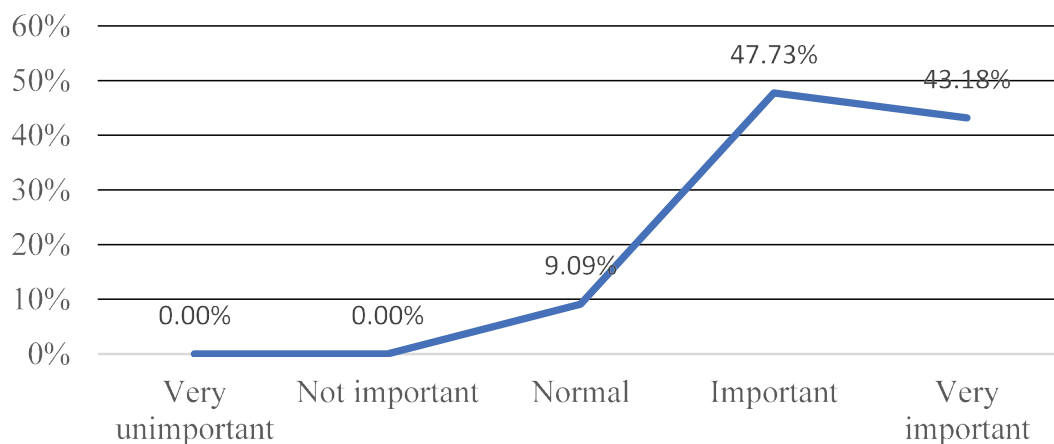


Fig. 8: The chart assesses the role of a partnership in supply chain management success. (Source: Authors).

Tab. 5: Assessment of the impact of factors on the overall relationship of supply chain members.

No.	Element group	1	2	3	4	5	RII
		Number of votes (%)	Number of votes (%)	Number of votes (%)	Number of votes (%)	Number of votes (%)	
1	Trust between supply chain members	0 0.00%	0 0.00%	27 20.45%	52 39.39%	53 40.15%	4.20
2	Information sharing	3 2.27%	3 2.27%	18 13.64%	72 54.55%	36 27.27%	4.02
3	Choosing the right partner	3 2.27%	3 2.27%	27 20.45%	57 43.18%	42 31.82%	4.00
4	Risk/benefit sharing	0 0.00%	0 0.00%	36 27.27%	66 50.00%	30 22.73%	3.95
5	Senior leadership commitment	5 3.79%	3 2.27%	24 18.18%	66 50.00%	34 25.76%	3.92
6	Problem solving	0 0.00%	3 2.27%	30 22.73%	81 61.36%	18 13.64%	3.86
7	Trading frequency	0 0.00%	6 4.55%	42 31.82%	63 47.73%	21 15.91%	3.75
8	Collaborative culture	9 6.82%	9 6.82%	30 22.73%	60 45.45%	24 18.18%	3.61

(Source: Authors).

RII, Relative importance Index.

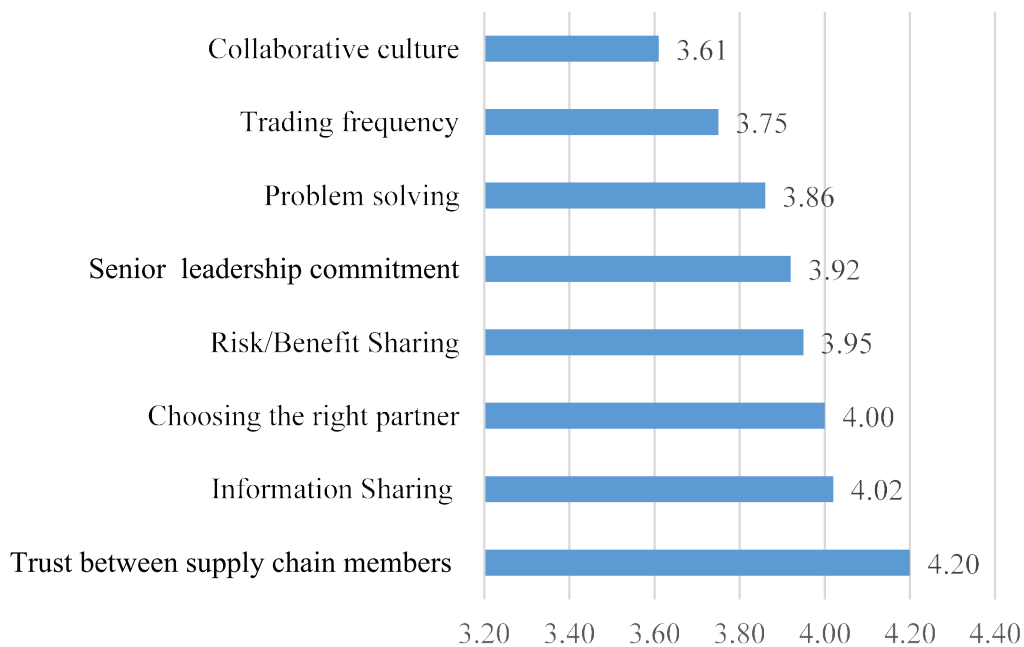


Fig. 9: The chart assesses the impact of factors affecting the relationship between members of the construction supply chain. (Source: Authors).

the factor 'Trust between members of the supply chain' is the factor assessed to have the greatest impact (4.2) on the cooperation relationship between members in the supply chain. This is followed by information sharing (4.02), choosing the right partner (4.0), sharing risks and benefits

(3.95), senior management support (3.92), problem solving (3.86), trading frequency (3.75) and culture of cooperation (3.61). This result is relatively consistent with previous studies of factors influencing construction supply chain relationships by other authors around the world.

4.3 Discussion of results

In general, the vast majority of construction enterprises from large to small to medium scale have been approaching and applying the construction supply chain management model.

Content 1: How businesses maintain relationships with partners

- From the survey results, the analysis obtained shows that construction enterprises have relatively attached importance to the cooperative relationship with partners in the supply chain.

Construction enterprises can maintain long-term, stable cooperation relationships or change customers/investors according to each project. This is explained by investors in the field of construction who only invest in the project once. There are also investors who are units specialising in the field of construction investment. These are potential investors, always investing in new projects. Construction enterprises all try to satisfy the investor and focus on maintaining a good relationship with the investor with the desire to continue cooperation.

- Maintaining a partnership with material suppliers is chosen by the majority of construction enterprises. This can be explained by the simple reason that these businesses are afraid of change and do not want to spend a lot of time trying to find new partners; or because they are aware that long-term cooperation with each other is beneficial. Also, construction enterprises have had activities to promote cooperation such as sharing information, helping each other overcome difficulties, cooperating together to constantly improve and improve the quality of supply of resources and efficiency of construction activities. However, many businesses still do not pay enough attention to maintaining long-term relationships that they often change partners; so, construction enterprises have also deprived themselves of the opportunity to reduce production costs.

The results of this survey are consistent with the results in the study of Toan et al. (2022). Thus, it once again affirms that Vietnamese construction enterprises are aware of the important role of cooperation to the success of construction supply chains, initially building and developing cooperative relationships and then having long-term cooperation with partners. This

helps construction enterprises avoid wasting time in finding new partners, save costs and ensure stable chain operation.

Content 2: Assess the importance of factors affecting the overall relationship of members of the supply chain

- The survey results show that all influencing factors have a huge impact on the partnership. In particular, the most influential factor is 'Mutual trust'. However, there are many other important factors such as choosing the right partner, how to share information, and sharing risks/benefits together. The survey results obtained are also relatively consistent with previous research papers.
- The 'mutual trust' factor is said to have the greatest impact on the cooperation because all relationships built, maintained and developed strongly are based on trust among members. Trust can be gained because the parties have cooperated with each other based on the principle of mutual benefit or both parties have proven their reputation in the construction market. Through previous cooperation, construction enterprises can see the professionalism and reliability in the way partners work to satisfy the set requirements and aim for common goals, bringing satisfaction to customers. As a result, the construction enterprise continues to maintain cooperation with the previous partner that they were very satisfied with.

The authors tried to invite people working in decision-making positions in supply chain partnerships to participate in the survey. However, approaching these leaders, they faced many difficulties. Hence, the number of senior leaders participating in the survey accounted for a modest proportion. Thus, it is possible that the assessment of the survey participants did not comprehensively reflect the research issue. However, this survey still provides reliable results as to the current status of the relationship and the impact of factors on the cooperative relationship. It thus, helps construction enterprises to further improve in building cooperative relationships with partners, contributing to increasing the efficiency of supply chain operations.

5 Conclusions

The present article has shown the current status of the relationship between members in the material supply chain of construction enterprises in Vietnam and has

assessed the impact of the main factors affecting the contractual relationship in the supply chain of construction materials. The research results show that the respondents rated the partnership as having a very important role to the success of supply chain operations. Vietnamese construction enterprises have relatively attached importance to cooperation in the supply chain of materials; The eight factors included in the survey are all assessed to have an important to very important level of influence in the supply chain cooperation relationship. The present article focuses on the relationship between construction contractors and customers, and construction contractors and material suppliers.

However, the results of the present article can be useful to evaluate the direct relationship existing between members in the construction supply chain. The results help determine the degree of influence the key factors have in improving the current relationships and in building future partnerships. Thereby, they help enterprises supply chains to build stable operations and bring in efficiency and competitive advantages in the market.

The present article is especially suitable for construction contractors who play a central role in the supply chain. This forms the basis for contractors to come up with measures for strengthening the cooperation between stakeholders, focusing on building cooperative relationships with strategic material suppliers and help in maintaining good relationships with investors.

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