

An Analysis of Value Chain in the Vietnam Construction Industry

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Abstract: A value chain in construction industry is implemented to ensure that a construction project is successful from the planning stages, all the way to the completed and approved building. Therefore, it is important to utilize a construction value chain because it ensures that the project delivers the maximum value for the least amount of capital. However, value chain analysis in the construction industry is little understood. The present study aims to analyze the status quo for the construction value chain in Vietnam. The findings indicated that there are three primary parts of the Vietnam construction value chain. The analysis results indicated that there are three primary parts of the Vietnam construction value chain which includes: (1) input factors (i.e., labors, materials, and machines); (2) construction processes (i.e., design, bidding, foundation construction, structural construction, and finishing works); (3) construction markets (i.e., civil construction market, industrial construction, infrastructure construction). The outcomes illustrated a comprehensive picture in the Vietnam construction value chain and build a strong platform to implement better appropriate tasks towards improving sustainable competitive advantages in the construction industry.

Keywords: Value chain, construction industry, costs

1. Introduction

The construction industry is one of the largest and most resource-consuming industries in the world, accounting for 50% of raw materials and 40% of global energy consumption (International Finance Corporation, 2018). In terms of value, GlobalData estimated that the global construction market reached 11.4 trillion USD in 2018, approximately 13.5% of the world's gross domestic product (GDP) (Duc, N.N., 2019). The construction sector value is mainly concentrated in developed countries with economic development and a large number of the population since these are the two major motivations of construction demands. As demonstrated in Fig. 1, the top 10 largest countries contribute over 60% of global construction industry value, led by China (25.4%), the USA (14.5%), Japan (5.4%), India (4.3%), Germany (3.6%), England (3.2%), Indonesia (2.8%), Canada (2.6%), Australia (1.9%), and remaining nations occupy 36.3% (GlobalData, 2019). Of which, China is the most significant construction market, not only because of the large scale but also the high growth rate for nearly 10 years. In developing countries, the construction industry is still in the high growth period which will be the motivation for the global construction industry in the foreseeable future. In fact, construction is essential for economic growth, thus it is occupying a high rate in the economy of developing countries and experiencing better growth

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rate compared to developed countries. In particular, from 2014 to 2018, the construction market in developing countries increased by 4.2% per year on average, doubling the growth rate at the remaining group (only 2.0% per year). By the year 2023, it is predicted the difference between the two groups would be larger, the construction market in developing countries was expected to rise by 4.6% per year, approximately three times growth in comparison with developed countries, at 1.7% per year. The growing market will be the primary motivation for the global construction industry, estimated to contribute about 80% global growth in 2023 (Duc, N.N., 2019; Vinh, N.T.Q., 2015).

The Vietnam construction industry has made significant progress towards modernization and globalization in recent decades with strong development in many fields such as construction technologies, construction project management, construction materials, architectures and construction planning, urban and housing development, and so on. The construction capacity has been improved to meet the demands of the modern construction sector, including large-scale projects requiring high quality and modern technologies in domestic and abroad. In 2019, Vietnam construction activities increased around 9 - 9.2%. The urbanization rate reached about 39.2%, an increase of 0.8% compared to 2018.

Specifically, the total production value of the whole construction industry reached VND 358,684 billion, contributing 5.94% of Vietnam's GDP. Vietnam has nearly 78,000 enterprises operating in the construction industry with around 4 million employees (Duc, N.N., 2019). Recently, labor productivity in Vietnam has been increased, but it is lower compared to different countries in Southeast Asia area (General Statistics Office of Vietnam, 2017; Tuan, N.V., 2018). Many years so far, although there have been great scientific and technological advancements, they have not yet been comprehensively discovered by construction companies. Particularly, labor productivity of construction workforce is only approximate to 85% of those gained in different industries (Hai, D.T. and N. Van Tam, 2019). The increased percentage of construction productivity reaches about 10%, while the average annual growth rate of all industries at about 16% (Anh, V., 2017; Van Tam, N et al., 2018).

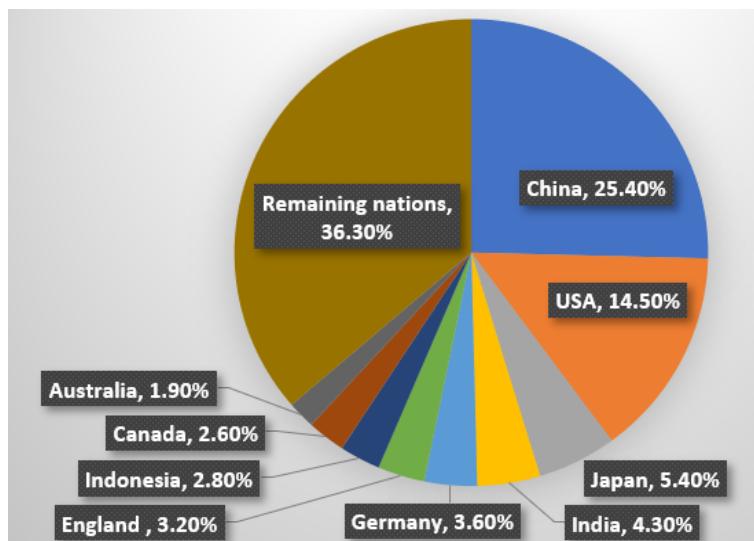


Fig. 1 - Top ten construction markets in the world (2017) (Duc, N.N., 2019; GlobalData, 2019)

In the present study, a systematic analysis in the Vietnam construction value chain was undertaken in order to illustrate comprehensive issues on the value chain of the Vietnam construction sector and critical recommendations will be proposed correspondingly. An analysis of construction value chain may make a contribution for construction stakeholders in the project implementation in various cases. For example, it can make change within a business activity, the products and services are offered, and its connections with different co-operations and their customers or clients. Also, it demonstrates that the goal of value chain analysis is “to create value that exceeds the cost of providing the product or service and generates a profit margin”.

2. Literature Review

A value chain is a set of activities that enterprises operating in a specific industry performs to deliver a valuable product (i.e., good and/or service) for the market (Weil, K.E., PORTER, 1985). The concept of the value chain on the basis of the process view of organizations, the idea of seeing a manufacturing organization as a system made up of subsystems with inputs, transformation processes, and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources (i.e., money, labor, materials, equipment, buildings, land, administration, and management). How value chain activities are conducted determines costs and affects profits (Porter, M., 1979). The value chains as decision support tools were added to the competitive strategies paradigm developed by Porter as early as 1979 (Porter, M., E., 1979). In Michael Porter's value chain, inbound logistics, operations, outbound logistics, marketing and

sales, and service are grouped as major activities. Besides, secondary activities involve procurement, human resource management, technological development, and infrastructure (Weil, K.E., PORTER, 1985; Porter, M., 1979). According to the Organization for Economic Co-operation and Development (OECD), the emerging of global value chains in the late 1990s served as a catalyst for accelerated change in the landscape of international investment and trade, with major, far-reaching consequences on authorities and firms (Gurría, A., 2012).

In the construction industry, construction projects differ in various types, scales, requirements, and locations and vary in types. Hence, it is directed by socio-economic conditions, objectives, regulations, codes, and resources that evolve with time. As a result, the specific contexts of construction projects also have an effect on the requirements, composition, and significance of different steps and actors in the value chains for those projects. A holistic approach is needed to define the construction value chain so all relevant stakeholders can jointly develop a strategy for investment decision and implementation of construction projects.

As the construction industry plays an important role to both national and global economic flows, several approaches to definite the construction value chain have been demonstrated, reflecting changing trends in technologies, processes, and projects (International Finance Corporation, 2018). A review of the literature shows commonalities in definitions of construction supply chains. For instance, a definition considers the value chain as a process that transforms raw construction materials into manufactured materials that are made into a final product (Foulkes, A. and L. Ruddock, 2007). Another reflects the specialized nature of each construction project, with new technologies helping the construction industry evolve into an “engineer-to-order” format where each product specifically meets customer preferences and requirements. Despite the relative niche use of engineer-to-order construction to date, it offers lessons for the broader construction industry (Dallasega, P. and E. Rauch, 2017). The operation of each stage as silos results in delays, missing information, and miscommunication, which is reflected in the fragmented nature of the value chain in the construction industry with its separate, unaligned sectors. The analysis considers the value chain for any construction project as variations arising within the fixed framework of three distinct phases (International Finance Corporation, 2018): design, production, and conversion of raw materials into manufactured products, and on-site construction. Each step comprises internal phases, processes, and stakeholders that interact to bring a project to fruition. The major sectors in the construction industry (i.e. aluminum, bricks/clay, cement, glass, plastics, and steel) are supported by the ancillary activities of companies working with construction financing, legal firms, and the like (Abatecola, G. and M. Cristofaro, 2016). The final stage, on-site construction may be for residential or commercial use and includes infrastructure, buildings, and industrial sites. The distinctness of these processes, as well as the fixed-term, project-based nature of relationships along with the supply chain, results in a highly fragmented industry structure.

In the construction sector, several diverse stakeholders operate in the value chain. The relationship between them is complex and changes from project to project. Several stakeholders are usually involved in a construction project such as investors, shareholders, developers, designers, constructors, product/material suppliers, asset owners/managers, users, and demolition contractors (International Finance Corporation, 2019; Dunant, C.F., et al., 2017):

During the past years, there have been several studies focusing on construction value chain analysis. For example, Dunant et al. (2018) conducted a study on cost and risk analysis distribution across value chain in the construction sector in the United Kingdom in order to explain options to make steel reuse profitable. The findings indicated that most of the substantial and capital-intensive changes required for the widespread adoption of steel reuse are concentrated on steelwork contractors and stockists; neither the costs of steel reuse, nor the risks, nor its benefits are spread equitably throughout the UK construction industry supply chain. The study of Abatecola and Cristofaro (2016) indicated executive competencies currently govern the construction value chain in Italy. Accordingly, adopting Upper Echelons Theory in researching the executive profiles of 109 important firms currently active in Italy, the results revealed that although homogeneity substantially regards the executive's gender, age, and level of education, heterogeneity is associated more with his or her functional background (Abatecola, G. and M. Cristofaro, 2016). A study on real and perceived barriers to steel reuse across the construction value chain in the UK was conducted by Dunant et al. (2017) who demonstrated that a detailed reconstruction of the construction industry cross-supply-chain barriers associated with steel reuse is a difficult proposition.

There is a contrast between perceived higher costs and time required to employ reused steel and the assessments of realized projects. Squicciarini and Asikainen (2011) defined a value chain statistical of the construction industry. The outcomes shown that existing statistical analysis often fail to capture the true scope of the economic impact of the construction industry and three main factors causing construction in economies worldwide under-appreciated include: (1) construction being mistakenly perceived as a barely dynamic low-tech low-growth sector; (2) the construction features peculiar characteristics that make it unique, complex and difficult to understand, depict and manage in its systemic dimension, and (3) the scarce quality, availability, reliability, and comparability of construction-related data that make it difficult to quantify the sector and to construct indicators. The study of Errasti et al. (2009) explained that the operational benefits of close coupling value chain function as embodied in the principles of concurrent engineering and supply chain management are well known and have been closely examined across a range of manufacturing sectors. Also, the findings indicated that despite the high levels of uncertainty and product variety that characterize the industry, the principles of close coupling value chain functions can be applied to subcontractor operations that are primarily manufacturing

orientated. Additionally, improvements in production and assembly productivity are possible with the result that total costs can be reduced and delivery performance improved.

3. Research Framework for the Study

In this study, the authors adopted the value chain analysis (Errasti, A., et al., 2009; Christopher, M. and D. Towill, 2001) to analyze the main activities in the Vietnam construction value chain which contains three major stages (see Fig. 2). This analysis consists of explaining the activities that generate, contribute value, and demonstrate cost distribution of the major activities.

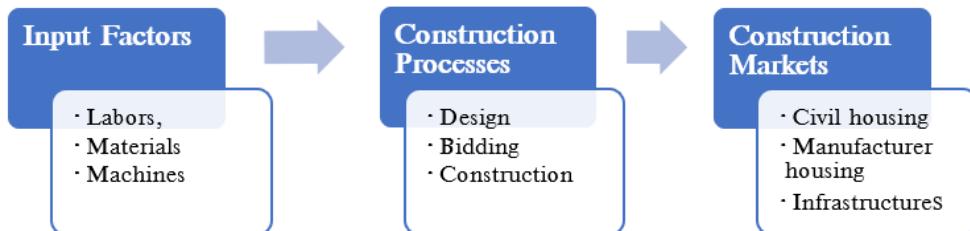


Fig. 2 - A research framework for analysis of Vietnam construction value chain

Michael Porter stated that primary activities in the proposed value chain include 5 activities such as inbound logistics, operations, outbound logistics, marketing and sales, and service (Porter, M., 1979). However, by referencing previous studies (International Finance Corporation, 2018; Dunant, C.F., et al., 2017; Dunant, C.F., et al., 2018; Squicciarini, M. and A.-L. Asikainen, 2011; Errasti, A., et al., 2009) and considering the status quo for the construction sector in Vietnam, the present study focuses on 3 main parts of Vietnam construction value chain as follows:

- Input factors include laborers (i.e., designers, project managers, architects, site supervisors, inspectors, and construction workers), materials (i.e. steel, concrete, aluminum, cement, plastics, bricks, and glass), and machines (i.e. tools and equipment).
- Construction processes include design (i.e. planning, architectural design, and structural design), bidding (surveying consultants, design consultants, estimate consultants, general contractors/subcontractors, and supervision consultants), construction organization (i.e. foundation construction, structural construction, and finishing works)
- Construction markets include civil housing, manufacturer housing, and infrastructures.

To analyze the value chain in the Vietnam construction industry, the different statistical methods were undertaken to collect the needed data. Specifically, the authors collected the necessary data from institutions of the Vietnamese government (i.e., General Statistics Office of Vietnam, Ministry of Construction, Central Steering Committee for the Population and Housing Census, WTO and International Trade Center). Besides, the secondary data from resources that have been officially published were also used in this study.

4. Findings

4.1. Input Factors

Generally, the cost of a construction work consists of 60-70% of material costs, labor costs accounts for 10-20%, and the remain 10-20% refers to machinery costs (Vinh, N.T.Q., 2015; McTague, B. and G. Jergeas, 2002; Hanna, A.S. et al., 2002; El-Gohary, K.M. and R.F. Aziz, 2014). In terms of contribution of materials to the construction cost, steel accounts for the largest share of about 60-70%, which is far higher than the share of cement, the second-largest distributor with only 10-15% (Duc, N.N., 2019).

Construction materials: It has been shown that the construction material industry in Vietnam has made great progress. Thanks to the right orientation, businesses have focused on investing in modern technology, restructuring product structure towards increasing the quality of products and replacing the importation with the exportation. Many building material products have been well-established brands and gained a foothold in either domestic or international markets, such as Viglacera, Fico and Vicem, etc... Particularly, Vietnamese construction material products have been exported to more than 100 countries in the world (Duc, N.N., 2019). In fact, the main types of construction materials have satisfied the consumption needs of society, meeting the domestic construction requirements. At the same time, several materials have joined the oversea markets (i.e., cement, tiles, construction glass, paving stone, and lime).

Construction workforce: the number of construction workforce is around 3.2 million (Cu, L.V. and L.V. Long, 2019). The number of jobs that the construction industry in Vietnam has offered is the fourth-highest compared to other sectors. Vietnam Association of Construction Contractors indicated that about 80% of construction laborers work seasonally, are not well-trained, lack of experience and skills, and do not meet the requirements for professionalism in

construction sites (Van Tam, N et al., 2018). In comparison with other countries in Southeast Asia, Vietnamese labor productivity is only half of the average. In Vietnam, labor productivity of the construction industry is ranked only 16th compared to other industries (Tuan, N.V., 2018), thereby the income of construction workers is much lower than that of other industries and other developing countries.

Construction machine: Every year, Vietnam imports about 15,000 construction machines but up to 95% of them are second-hand machines with an average import turnover of 300-400 million USD. With the advantages of cheap prices (only about 25% of the new machines) and appropriateness for the construction conditions in Vietnam, pre-owned machines are preferred by many small and medium contractors (Vinh, N.T.Q., 2015). However, using this category of equipment also has drawbacks. For example, the new owners of these machines may have to face cumbersome procedures, the higher frequency of malfunction, and the lower productivities compared to new devices. According to the Vietnam Association of Mechanical Industry, Vietnam currently has about 2,000 large and medium-sized companies (Cu, L.V. and L.V. Long, 2019), so the demand for construction machinery is huge. Nevertheless, except for a few enterprises that produce lifting equipment and heavy trucks, the market for producing construction machines in Vietnam remains vacant. Consequently, almost 100% of Vietnam's construction machines have been imported. According to the statistics, Vietnam currently has spent about US \$ 300-400 billion importing construction machines annually, which equates to roughly 12,000-15,000 machines. Almost all of them are excavators and nearly 95% are used machines (Duc, N.N., 2019). There are several factors to take into consideration the roots of this fact. Limited financial capability of Vietnamese enterprises as well as the affordable prices of old machines, which are only a quarter compared to new ones, are the primary reasons for this. Some countries around the world have had a large number of construction machines exported to Vietnam, such as Japan, Korea, China, and the US, with famous brands like Komatsu, Hitachi, and Kobelco from Japan; Doosan, Hyundai, and Daewoo from South Korea; as well as Caterpillar from the USA.

Comparing three inputs mentioned above, labor and machinery are the main competitive factors, affecting all three criteria for contractor selection, including experience and capacity, engineering, and bidding price. In contrast, the cost of construction materials accounts for the largest proportion. This factor is very difficult to control, having a limited effect on the competitiveness of contractors, yet affects directly to profit of contractors when implementing the project. In general, the construction cost in Vietnam is pretty low compared to the average of the Southeast Asia region and the world. The main reason for this is the cornucopia of both natural resources to produce construction materials and manpower needed in construction stages. As demonstrated in Fig. 3, the average construction cost of civil works in Ho Chi Minh city was about 814 USD per m² in 2018, much lower than that of most other regional markets such as Hong Kong-China (3.749); Tokyo-Japan (2.661), Singapore (2.100), Seoul-Korea (1.730); Kuala Lumpur-Malaysia (880).

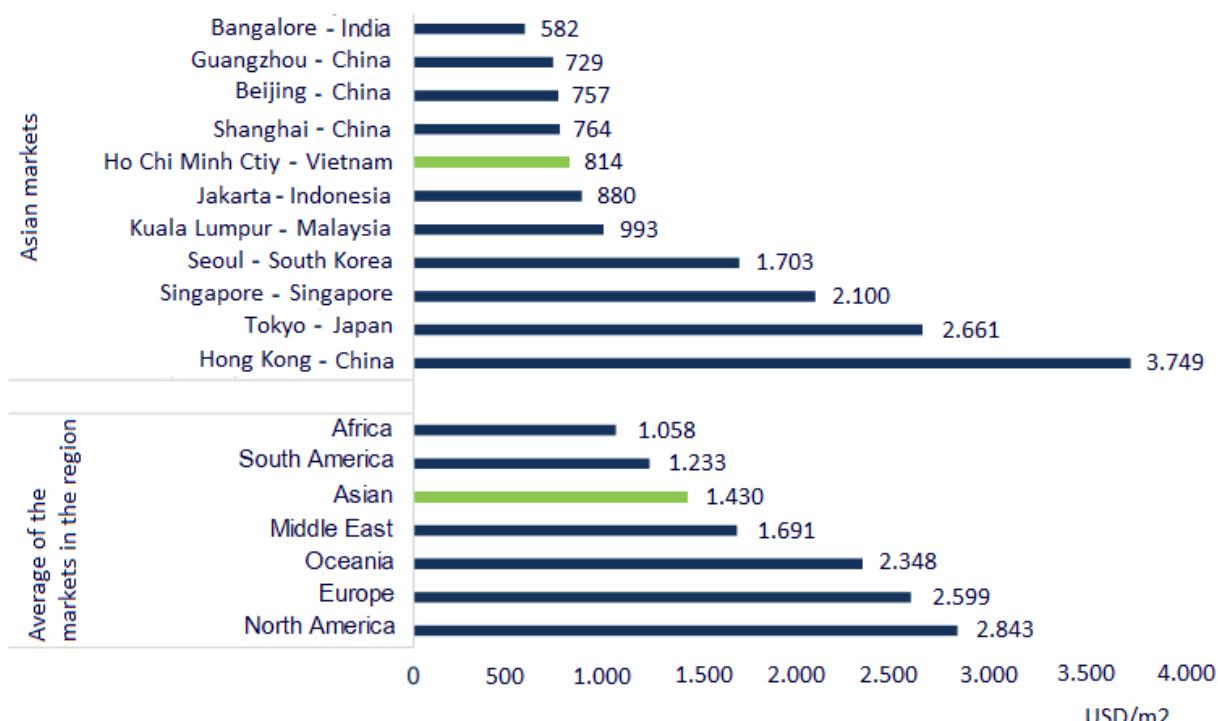


Fig. 3 - Average construction cost in 2018 (Source: BMI)

4.2. Construction Processes

The normal construction process consists of 5 main stages: (1) Design, (2) Construction and installation bidding, (3) Construction of foundations, (4) Construction of superstructure and brickworks, and (5) Finishing.

Design: It has been shown that the level of construction is growing and it has gained a lot of advancement in the last few decades, leading to higher and higher requirements for construction design. Hence, the adoption of technological advancement is increasingly being emphasized. In the world, many developed countries tend to use modern design software together with building information modeling (BIM) tools. The combination offers contractors to integrate the design process horizontally to reduce cost and design duration as well as limiting failures. In general, the design process only accounts for about 5-10% of the construction cost, yet affects more than 70% of the quality and efficiency of the project (Duc, N.N., 2019). In addition, the changes in design during the construction stage are also one of the main causes leading to delay schedules and cost increase . Therefore, the more effort spending in the design phase, the better it may help to minimize risks and improve construction efficiency.

Construction and installation bidding: Bidding is the process of helping investors and contractors find suitable partners, which is usually applied in the construction industry due to the large-scale and complicated projects. Investors can be able to select the optimal contractor among the participating bidders, whereas contractors may select the appropriate investors to participate in the bidding. It is essential to find an appropriate partner at this stage because construction contracts are often large-scale and long-term. Therefore, any problems occurring during the contract period can cause great damage to both sides. Within the construction industry, bidding is a competitive method to select the most suitable contractor having the capability of meeting the requirements of projects. Currently, the main forms of construction bidding used in Vietnam are (1) open bidding, (2) limited bidding, and (3) direct appointment of a contractor. Open bidding is a form of bidding without limiting the number of bidders participating in it, whereas restrictive bidding is a form of bidding in which the bid solicitor only invites a number of bidders (at least 3) who are capable of participating. The final form is the direct appointment of contractors, in which, investors directly opt contractors that meet the requirements without having to organize bidding. It has been shown that in most bidding packages, the primary concern is about low bids, which have led to the fact that construction companies tend to offer a low price to get the contract award. Then, because of low prices, they may neglect or hire weak capacity subcontractors to implement the bidding package. In addition, the contractors might seek every way to adjust the contract prices, causing the delayed schedules in many transport works and increased investment cost by 2-3 times. Bid prices have witnessed a downward trend since 2010 when the real estate market froze, leading to fierce competition in the construction industry. The gross profit margin in the civil construction industry decreased from 10% to 5% from 2010 to 2013. However, once the housing market started to warm up, especially in the low and middle-income segments and the overall economic situation was improving, bidding prices increased from 3% to 6% in 2015 and subsequent years (Duc, N.N., 2019). The bidding process can be divided into several stages: (1) Bid solicitation → (2) Bid submission → (3) Bid opening → (4) Evaluation the bid documents → (5) Bid selection → (6) Contract formation. The duration of this process depends on the size of the project, which can be up to several months.

Construction of foundations: This stage plays a decisive role in ensuring the quality of works, especially high-rise buildings. Contractors are now always toward new technologies to minimize the cost and duration of construction. Some following new methods are being applied very effectively

- **Top-based method:** is one foundation treatment method that does not use concrete piles but uses funnel-shaped concrete blocks in the macadam foundation on soft soil area to increase the ability to receive the load of the foundation, reducing settlement and consolidation time of soil. This technology can be applied to buildings with elevations up to 30 floors, reducing about 30 to 60% of the cost and 50% of construction duration (Vinh, N.T.Q., 2015). This method has been applied in several works such as 12-floor Lo Su Hotel; 24-floor Ocean View apartment; 14-floor south headquarters of the Military Science and Technology Institute,; Nam An building with 21 floors and 1 basement.
- **Vacuum Consolidation method:** Instead of increasing the stress in the soil mass by increasing the total stress based on the conventional loading method, the vacuum consolidation technique creates a pre-compressive load by reducing the water pressure in the hollow hole while keeping the total stress. This technology can save 50% of construction costs compared to traditional methods. It were applied in many projects such as Nhon Trach 2 Thermal Power Plant; Dinh Vu polyester synthetic fiber factory; Thi Vai LPG cold storage project; Long Phu Thermal Power Plant; Ha Tinh Formosa Steel Complex, and Ho Chi Minh City Long Thanh - Dau Giay highway project.
- **Sand compaction piles technology:** This technology is mainly applied to traffic projects with complicated geological conditions that cannot use vacuum consolidation technology. It uses large-diameter compacted sand piles (D700), larger than regular sand piles (D400) for greater shear resistance, better drainage, and consolidation. Therefore, this method can increase productivity by 71% compared to conventional technologies (Vinh, N.T.Q., 2015).

- **Top-down construction method:** This technology applies to construct the underground section of a building from top to bottom direction, which differs from the traditional bottom-up method. In this technology, buildings can be simultaneously constructed the underground section (basement and foundation), while constructing some floors of the superstructure. Therefore, this method can shorten construction duration by 30% and save up to 30% of construction costs (Vinh, N.T.Q., 2015). This technology were applied in the construction of works such as Bitexco Financial Tower (3 basements); Vincom - Zone B (6 basements); Royal City (5 basements); Metro line 1.

Construction of superstructure and brickworks: In terms of civil works, the common house frame consists of 5 primary components: (1) columns (to transfer the loads to the ground), (2) beams (to connect and transfer the loads to columns), (3) slabs (overlaid on beam systems, which support the objects in the house), (4) walls (to cover the building and divided spaces), and (5) stairs (connecting floors). Currently, new construction technologies and methods focus on two main parts (floors and walls) to minimize their weight and the number of materials needed for the building. Several new methods have been applied for floor construction in the world such as Waffle Unit Flooring System, or Bubble Deck Slab. These methods can not only help to reduce the volume of works by about 30%, and from 30 to 50% of the cement needed for each floor but also double the bearing capacity of sfloors. Besides , they also can be able to reduce the construction duration for each floor from 5 to 7 days (Duc, N.N., 2019; Vinh, N.T.Q., 2015). Moreover, post-tensioning is the method of reinforcing the construction by using the technology of steel plate gluing to reinforce the structure of reinforced concrete spans. Because these concrete structures are capable of bearing a greater load than conventional concrete structures, the floor system does not require girder support and reduces the spacing between the larger columns creating more space, etc. Since 2011, the Government of Vietnam has issued a regulation that requires high-rise buildings (from 9 floors and above) to use at least 30% of unburnt materials to build walls. There are 2 types of unburnt materials that can be mentioned today such as unburnt bricks and light concrete. (1) Unburnt bricks have several different types, yet the most common one is autoclaved aerated concrete bricks, which weighs half or even only by one third compared to clay burnt bricks. Therefore, using this type of brick can reduce the volume of works by 50%, thus reducing the cost of constructing foundations and structural systems. Additionally, unburnt bricks also help to reduce construction duration by about 30%, due to the large size compared to conventional bricks (100mm x 200mm x 600mm). Therefore, in general, the use of unburnt bricks contributes to the reduction of construction costs by 7 to 10%. (2) Lightweight Cellular Concrete or foam concrete technology can help to reduce 70% the amount of mortar, while increase masonry labor productivity by 150% and decrease transport cost by 30% compared to normal concrete. Similar to unburnt bricks, using lightweight cellular concrete will reduce up to 30% of the total loads transferring to the foundation, reducing the construction cost of the foundation. Hence, the total construction costs can reduce by 5 to 7% for houses from 3 to 5 floors and more than 7% for houses of 6 floors or above (Vinh, N.T.Q., 2015).

Regarding industrial and infrastructure construction, several new methods have been used quite popular currently to reduce the weight of works and the construction duration. These methods are pre-engineered steel building and precast concrete. Pre-engineered steel buildings are made according to predetermined architectural and technical drawing requirements. This method only uses pre-engineered connections and pre-defined materials to design and build building structures. Therefore, using pre-engineered steel building technology can significantly reduce the duration in design, manufacture, and erection stages. Besides, the construction process is relatively simple with 3 main stages: (1) Design, (2) Processing of components, and (3) assembly at the construction site. Pre-engineered steel building technology can be applied in both industrial and civil construction. Similar to this method, prefabricated concrete structures will be manufactured first according to the technical designs at the factory and then transported and installed at the construction site. The biggest advantage of this technology is a 25 to 35% reduction in duration and cost of construction (Vinh, N.T.Q., 2015). Moreover, because most of the components are manufactured in factories, the product quality is guaranteed to be at the best level. It also can avoid the influence of climate conditions to the quality and schedule of concrete work compared to placing concrete at the construction site. It also will significantly reduce time, manpower, and especially reduce the needed volume of construction materials such as scaffolding and formwork for remaining works at the site.

Finishing section: Finishing is the last stage that creates the beauty and comfort quality of the building. In comparison with other works in construction, the finishing works do not place much emphasis on bearing issues yet requirethe aesthetics . The finishing stage consists of follow tasks: plastering, screeding, tiling, wall painting, electrical engineering systems installing, water supply and drainage system installing, installation of telephone, and lightning protection system. In terms of high-rise buildings or office buildings, the building can be categorized into two main parts: construction and M&E part. In which, the M&E section may account for 40 to 60% of the total volume of the project. The M&E section can usually be divided into four main categories including (1) Ventilation and air conditioning systems, (2) Water supply and equipment of sanitation, (3) Electrical part, and (4) Fire detection and alarm systems. In particular, the electrical part accounts for about 40 to 60% of the volume of the M&E section, or even up to 70 to 80% in several projects (International Finance Corporation, 2018; Duc, N.N., 2019; Vinh, N.T.Q., 2015).

4.3. Construction Markets

According to GlobalData, the value of Vietnam's construction products in 2018 reached VND 1,356 trillion, equivalent to 24.5% of the GDP in the same period and nearly double the world average (13.5%) (GlobalData, 2015; Vinh, N.T.Q., 2015). The output of the construction industry in Vietnam is diverse and there is no universal classification method yet. This paper divides mainly according to the use purposes, including housing, non-residential building, and infrastructure. In addition, houses and the non-residential house can be divided into civil works, including houses, hotels, offices, commercial centers, etc., and industry works, which include industrial parks, factories, etc. In terms of value, housing is estimated to have the highest share at 45%, followed by 32% for non-residential and 23% for infrastructure (Vinh, N.T.Q., 2015).

Civil construction market: It is impacted and greatly influenced by construction civil and the real estate markets. Five primary factors impacting this market include: (1) demographic information (i.e. age, amount of income, population growth, and urbanization rate), (2) interest rates, (3) the health of the economy (i.e., GDP growth, unemployment rate, inflation, and consumer confidence), (4) supportive policies from the government, and (5) FDI. According to the Viet Nam Population and Housing Census of 00:00 hours on 1 April 2019: Implementation organization and preliminary results, about 10.4 million people were added to the population of Viet Nam compared to 2009. The average population growth rate from 2009 to 2019 was 1.14% annually, which declined slightly in comparison with the data of the last decade (1.18% per year) (Central Steering Committee for the Population and Housing Census, 2019). Furthermore, a report from World Urbanization Prospects estimates that by 2030, the country will have about 105.45 million people and the urban population will account for 44.2%, equivalent to 46.6 million people, increasing 48% compared to today. In 2019, the housing area per capita in Vietnam was 23.5m²/individual. This figure for urban citizens was 24.9m² per person, while 22.7 m² per person was the average housing area for people living in rural regions. In comparison with the figures in the year 2009, the average housing area per person increased by 6.8 m² (Central Steering Committee for the Population and Housing Census, 2019). However, this figure is still lower than the figure of 26 m² per person by 2020 according to the National housing development strategy toward 2020, vision to 2030 (Vinh, N.T.Q., 2015; Central Steering Committee for the Population and Housing Census, 2019). Moreover, the preliminary results of the 2019 Census also indicated that 6.9% of households in Vietnam, which equates to about 1.4 million households with around 5 million persons, are living in either temporary or simple dwellings (Central Steering Committee for the Population and Housing Census, 2019). Because of these factors, the development potential of the civil construction field will remain very high.

Industrial construction market: Industrial construction depends on the demand for investment in new infrastructures and production expansion of both Vietnamese and foreign enterprises. Therefore, the demand for industrial construction in Vietnam will fluctuate according to the health of the economy and the amount of FDI. In fact, the annual amount of FDI in Vietnam depends on several factors that are external factors (i.e., world economic context, expansion needs of multinational corporations, capital flow trends) and internal factors (i.e., market growth, legal procedures, business environment, labor, and infrastructure). According to the statistics of the FDI Intelligence organization, five major factors affecting FDI attraction (i.e., market growth, market access, business environment, qualified human resources and infrastructure, and low operating costs). Another survey of Standard Chartered indicates that the primary reason for the decision to invest in Vietnam is the large consumer market, as well as low labor and operating costs. This shows that the country still has many restrictions on infrastructure, legal framework, and policies to support FDI enterprises. The global economic situation is still facing many difficulties. However, the national economies with big FDI in Vietnam are still recovering. South Korea, Japan, Singapore, Taiwan, and the United States are the countries with large investment capital in Vietnam annually (Vinh, N.T.Q., 2015). In particular, only Japan has a growth rate that is expected to decrease in the following years. Therefore, the prospect of attracting FDI in production is still very positive when conglomerates such as Samsung, LG, and Intel continue to invest in Vietnam.

Infrastructure construction market: Technical infrastructure is one of the basic factors for attracting FDI in Vietnam. However, as mentioned in industrial construction, underdeveloped infrastructure is one of the weaknesses of Vietnam. This is the top concern for investors and businesses before making decisions. It has been shown that a country with adequate communication systems, transport networks, energy, water supply, and drainage systems, as well as financial and banking service facilities, will facilitate the development of FDI projects. In addition, reducing the cost of transportation and information will increase investment efficiency. Therefore, to boost FDI and economic growth, infrastructure development is very essential today. Based on the estimation, logistics costs in Vietnam account for about 25% of GDP, which is higher than the average of the world (14%) and other countries in Southeast Asia (Vinh, N.T.Q., 2015). In terms of the Logistics Performance Index (LPI) of the World Bank, among the countries attracting large FDI capital in the region, Vietnam is only higher than Indonesia and India. Moreover, despite the noticeable improvement over the years, Vietnam's infrastructure still ranks very low compared to other countries worldwide. Looking on the bright side, with efforts in recent years, the quality of Vietnam's infrastructure in 2015 was upgraded 11 places compared to 2010, according to the overall assessment of the World Bank. It is estimated that in 2020, the amount of capital that needs to be attracted to invest in infrastructure in Vietnam is extremely large. Particularly, it is about VND 202,000 billion per year for transportation infrastructure and roughly VND 125,000 billion per year for power infrastructure projects (Duc, N.N., 2019; Vinh, N.T.Q., 2015). With the aim to attract enough amount of capital, the Vietnamese Government is also making efforts to improve the legal framework for PPPs and ODA investment.

According to the Vietnamese government's Report No. 25/BC-CP on January 30th, 2019 (The Vietnamese government, 2019), over VND 1.6 million billion from the private sector was mobilized to invest in the PPP form in many fields. Specifically: the transport sector has a total investment of VND 672.345 billion (including 118 Build-Operate-Transfer (BOT) contracts; 99 Build-Transfer (BT) contracts; 2 Build-Own-Operate (BOO) contracts; 1 BOT & BT); technical infrastructure with a capital investment of VND 39.568 billion (1 BOT; 31 BT); office and administrative centers have a total investment of VND 5.125 billion (19 BT; 1 Build-Lease-Transfer (BLT) contract); energy sector with investment capital of VND 857.209 billion (18 BOT contracts); investment capital for water supply, sewerage and the environment is 25.247 billion (1 BOT; 15 BT; 2 BOO); VND 4.632 billion is the amount of investment capital for culture and sports (1 BOT; 10 BT); and 1.285 billion VND for education and training (6 BT) and 3.834 billion VND for other fields (10 BT and 1 BOO).

5. Vietnam Construction Industry Prospects

The prospect of construction markets is a decisive factor for the contractor's prospects. On the contrary, the input costs are often quite similar and affecting the contractors' profit more than the future business prospects. As provided in Fig. 4 and Fig. 5, Vietnam's construction industry is forecasted to have an average growth rate of 6.9% per year in the next several years, despite a slight decrease compared to the average of the last decade (7.1% per year). However, it remains at a high level compared to the world's average ((Duc, N.N., 2019)). This figure is consistent with the assessment that Vietnam's construction industry has reached the end of the growth period, preparing to enter the restructuring phase.

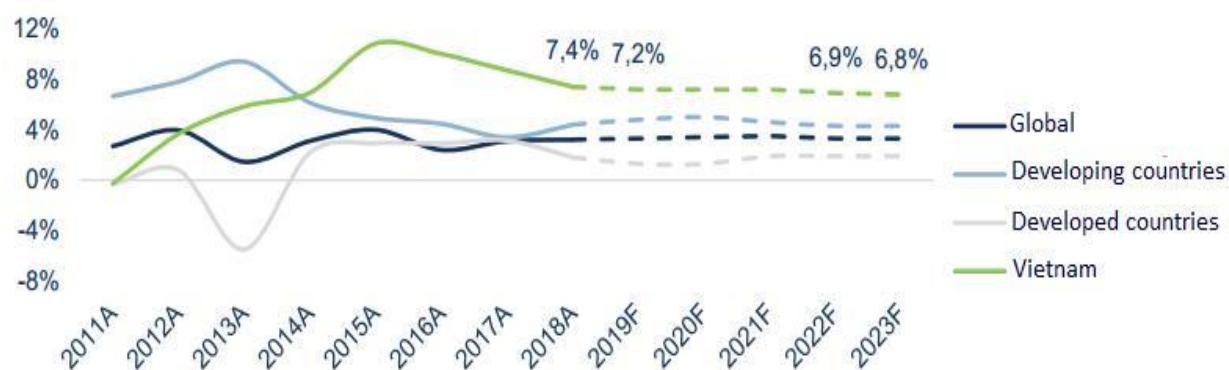


Fig. 4 - Construction markets growth rate (Sources: BMI, GlobalData)

Regarding the prospect for construction products, a BMI research suggests that the main growth motivation of the construction industry in the next 5 years will come from non-residential houses (8.4% per year) and housing (6.9% per year). In contrast, infrastructure construction has the lowest growth rate, reaching only 5.5% per year on average (Duc, N.N., 2019; GlobalData, 2019; Vinh, N.T.Q., 2015).



Fig. 5 - Growth of construction value by-product (Source: BMI)

Private and foreign capital is the driving force behind the construction growth of housing and non-residential house. Since 2015, the development investment capital of the whole society has increased by 9% per year on average, of which non-state and foreign investment capital has increased by approximately 12% per year (Duc, N.N., 2019). In the favorable economic environment and current attractive policies for foreign investment, these two sources of investment capital are expected to keep the motivation and continue to promote the demand for the construction of housing and non-residential house. On the contrary, state investment capital increased by only 5.3% per year in the same period (Duc, N.N., 2019). This is a consequence of challenges in Vietnam's economic structure such as budget deficit and ineffective management of the public investment. The shortage of public investment is the reason why infrastructure is expected to have the slowest growth rate among future construction products.

Housing construction is expected to grow by an average of 7.1% annually to 2028 (Duc, N.N., 2019). The growth rate is expected to decline in 2019 as well as 2020 and recover thereafter, mainly due to real estate market stabilization measures of Government. In the long run, housing demand can be estimated through demand from demographic factors and the need to replace when a dwelling is old, broken, or moved. According to the World Bank projection, Vietnam's population will reach 105.45 million by 2030, corresponding to average growth of 0.7% per year (Duc, N.N., 2019). Along with that, household size decreases gradually by an average of 0.03 people per household annually. Most of the future housing demand in Vietnam will be in the cities. According to the same projection of the World Bank, over one million residents will move to urban areas every year, creating high housing demand, especially in the affordable and mid-end segments. BMI estimates that Vietnamese cities will need an addition of 374,000 apartments annually to meet the needs of this population flow. In particular, Ho Chi Minh and Hanoi respectively need 134,000 and 130,000 apartments annually, equivalent to about 40% of the national demand (Duc, N.N., 2019; Vinh, N.T.Q., 2015).

In the next 10 years, non-residential house construction has the highest real growth rate among Vietnam construction products, reaching an average of 7.6% per year. This is driven by tourism and industry. The growth rate of this sort of house has experienced as the highest in 2019 and 2020 due to the short-term advantages that the US-China trade war brings to Vietnam. In the long run, consumer demand will be driven by the rapidly improving living standards of the Vietnamese people. Vietnam's middle-class growth is the highest among Southeast Asian countries. According to the World Bank, about 13% of the population in Vietnam is in the middle class currently and it is expected to increase to 26% in 2026 (Duc, N.N., 2019). This means that nearly 2 million people will join this class every year. With the income of more than 15 million monthly, middle-class people can not only afford enough for living expenses, saving for the future but also spend on discretionary expenses such as tourism, shopping. In the medium term, investment in industry and tourism will be supported by low labor costs, administrative reform policies, and free trade agreements in Vietnam.

Joining the world value chain through free trade agreements (FTA): Vietnam has so far signed 13 free trade agreements and is in the process of negotiating three other agreements (WTO and International Trade Center, 2020). Trade agreements will play an important role in expanding markets for Vietnam's exports. They also can attract investment from foreign capital and increasing the application of international advanced technology. According to BMI, infrastructure construction is expected to have the lowest real growth in the construction industry in the next 10 years by 5.7% per year, mainly due to limitations in mobilizing investment capital. Because of the low quality of available infrastructure, Vietnam needs to increase investment to meet demand from urbanization and economic growth. The World Economic Forum (WEF) has assessed the quality of Vietnam's infrastructure at 66/100 points while the East Asian and Pacific average was 75 points (Duc, N.N., 2019). In which, the factors with the lowest ranking include road connectivity, road quality, and aviation service performance.

The infrastructure investment demand in Vietnam was about 19 billion USD in 2019 and growing at 2.6% per year. It was the result of a high urbanization rate, plus high but uneven economic growth. About 75% of Vietnam's exports and imports come from 10 big provinces and cities, which located around Hanoi and Ho Chi Minh cities, causing logistical and transportation bottlenecks. Therefore, infrastructure investment is essential to reduce the cost and time of goods transportation, ensure social stability, and support economic growth. In addition, the highest demand for infrastructure investment in Vietnam is energy (44%), followed by road (21%), and telecommunications (17%). Vietnam spends around 5 to 6% of GDP on infrastructure annually, nearly double the world average, yet still meets only about 60% of investment requirements (Duc, N.N., 2019). The primary reasons for this are the limited public investment and the constraints and weaknesses in public investment project management. Traditional infrastructure investment sources are running low on, the Vietnamese government can only provide 30% of the total infrastructure investment needed. In the past, most of Vietnam's infrastructure investment came from Official Development Assistance (ODA) loans, state budgets, and government-guaranteed loans. However, this solution is unsustainable because it is more difficult to mobilize ODA because of several reasons: (1) Vietnam becoming a middle-income country, (2) the prolonged budget deficit, and high public debt in Vietnam. These reasons limit the ability of Government investment. The Vietnam public debt-to-GDP ratio peaked in 2016 at 63.7%, close to the highest level of 65% set by the National Assembly. As a result, the Government had to cut recurrent spending, restructure public debt, and tighten government guarantee for new loans. Consequently, GDP increased faster than public debt since 2016, the public debt-to-GDP ratio decreased to 58.4%. This also means that the Government's short-term and medium-term infrastructure investment capital will be limited. According to the World Bank, public investment capital in Vietnam accounted for about two-thirds of the value of infrastructure investment in

2015. However, the public investment plan for the period 2016 - 2020 revealed that the state budget is only capable balance up to 30% of the investment needs of ministries and localities (Duc, N.N., 2019; Vinh, N.T.Q., 2015).

6. Conclusions and Recommendations

A construction value chain is a type of business paradigm that includes various needed for project. For construction sector, a value chain is formulated to ensure that a project is successful from the planning phase, all the way to the completed and approved building. Once a value chain is adopted in the construction sector, there is expected to be additional value added to project that is completed. The findings revealed that the Vietnam construction value chain contains three main categories such as input factors, construction processes, and construction markets. Besides, the results indicated that the Vietnam construction industry is rolling at the end of the growth period, preparing to step into the restructured stage. The construction industry has been predicted to grow by 6.9% per year in 2028, which mitigated in comparison with the average 10 years ago (7.1% per year) (Duc, N.N., 2019) but remained higher compared to the world average. Based on the findings, the following recommendations are proposed as a way to suggest stakeholders should focus on investment in several specific aspects of the construction sector.

In short-term: residential housing and infrastructure should not be invested any more, since the growth of these two sectors is expected to be low in the 2019 - 2020 period, which reaches 6.0% per year and 5.6% per year respectively. Construction of residential houses has been decelerated due to the government's measures to stabilize the real estate market and limited investment in infrastructure projects by public investment capital. In contrast, construction investment in different types of housing (i.e., offices, hotels, malls, manufacturers,) should be encouraged because the growth reached 9.8% per year in the period 2019 - 2020 (Duc, N.N., 2019), mainly due to the USA - China trade tensions leading to the wave of investment in China to Vietnam and export growth to the United States.

In the long-term: the Vietnam construction market has significant potential with an expected growth rate of about 7.1% per year to 2023, which double the world average (Duc, N.N., 2019). However, Vietnamese contractors will be under increasingly competitive pressure during this period, partially because of the slower growth rate, plus international contractors entering the Vietnam construction market. This is a challenge but also an opportunity for Vietnamese contractors to be able to cooperate and accumulate advanced technology from foreign contractors.

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