Alignment between Supply Chain Structure and Operations Strategy of Traditional Wholesale Food Markets in Indonesia

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Abstract

Traditional Wholesale Food Markets (TWFM) in Indonesia play a crucial role in food distribution by ensuring access to fresh produce, supporting food security, and sustaining livelihoods. Even though applying an informal way of working, the vendors in TWFM implement unique strategies developed through years of experience to overcome supply chain challenges. This research structurally explores the alignment between the supply chain (SC) structure and operational strategies of TWFM in Indonesia to develop context-specific strategies that enhance overall efficiency and adaptability.

A selection contingency approach that emphasises logical fit without considering performance is used to analyse the alignment between all the attributes, including the effect of product characteristics. The study adopted a qualitative methodology, combining structured interviews with TWFM vendors and the application of weighted and ranked scoring methods to enable comparative evaluation of key variables.

Findings indicate that the operations strategy of TWFM does not fully align with the SC structure. The main motivation for selecting a strategy is performance, which is strongly driven by the cost-efficiency factor. The product characteristics shape the SC structure and operations strategy, together with the consumer preference and a strong relationship between SC members. TWFM are noted to have a network governance system with either dispersed or focused geographic dispersion based on the product. This study contributes to the literature on traditional food markets by providing insights into the contextual factors influencing supply chain alignment. It offers practical recommendations for policymakers and stakeholders to enhance TWFM's efficiency and sustainability.

Keywords: *Traditional Wholesale Food Markets, Supply Chain Structure, Operations Strategy, Indonesia*

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1. Introduction

Traditional wholesale food markets (TWFM) are marketplaces where large quantities of food products are bought and sold, primarily for resale by retailers and food service operators rather than for direct public consumption (Cadilhon et al., 2006). TWFM have played a significant role in food security policies across various nations, especially in developing countries where they are essential agricultural product distribution channels (Majiid et al., 2020). Ferdian et al. (2020) describe traditional markets as the pillar of a small society's economic buffer.

TWFM dominate the market share of fresh fruit and vegetable (FFV) retail in urban areas in Asia despite the rise of supermarkets and modern supply chains (Zhang & Pan, 2013). Affordable prices, fresh quality products, and a high level of service by the traders are reasons customers prefer TWFM over modern supermarkets (Nugroho et al., 2021). Not only on the customer's side, TWFM also sustain millions of farmers and traders, supporting livelihoods across the supply chain (Cadilhon et al., 2006). In Indonesia, approximately 13,450 traditional markets accommodate over 12 million traders (Kurniasari, 2023). These markets also serve as sources of regional taxes, hubs of trade, centres of economic growth, local currency circulation points, and providers of job opportunities (Maryam et al., 2021).

However, urban TWFM face logistical challenges in sourcing and distributing fresh produce due to their reliance on external suppliers outside the region while dealing with short shelf life along the road (Cadilhon et al., 2006; Midmore and Jansen, 2003). A wide range of geographic areas, both upstream and downstream (defined as geographic dispersion), is proven to remarkably impact a firm's performance (Kalchschmidt, 2020). Increased geographic dispersion in the suppliers and customers' locations negatively affects performance because it increases costs, lengthens response time, and decreases customer service level, especially for perishable products (Lorentz et al, 2012).

To achieve a higher performance, the logistics practices or strategy need to be consistent with or fit with the supply chain (SC) structure (Stock et al., 2000, Lorentz et al, 2012). Besides geographic attributes, Stock et al.(2000) propose channel governance as another critical aspect in SC structure. Channel governance is associated with two dimensions: vertical integration and supply chain linkage attributes (Stock et al., 2000). This governance might have a significant role in how the SC are set up and operated, eventually affecting the vendor's performance (Bonatto et al., 2019; Sharma et al., 2023).

Additionally, the effect of product characteristics is also taken into account in this research, because the unique nature of FFV might influence SC structure and decision making of the TWFM vendors (Midmore and Jansen, 2003; Tama et al., 2018).

While some research has highlighted that vendors in TWFM employ unique strategies developed through years of experience to overcome challenges (Cadilhon et al., 2006; Yeshiwas et al., 2024), there is a lack of structured frameworks and limited research on supply chain structure and operational strategies of these markets in developing countries (Larasati, 2024). This creates a gap in understanding their effectiveness given their particular contextual setting. Addressing these issues requires a deeper exploration of the alignment between supply chain structure and operational strategies within the context of TWFM, particularly in Indonesia as a developing country, to identify context-specific strategies that enhance overall efficiency and adaptability. Therefore, the objective of this research is to characterise the SC structure of TWFM in Indonesia and find its alignment with the operations strategy applied by vendors in the TWFM based on product characteristics.

To achieve this objective, this study aims to address the following research question (RQ): "What is the alignment between the SC structure, product characteristics, and operations strategy of TWFM in Indonesia?" To structure our study, we use a conceptual framework based on the research of Stock et al. (2000) and Qi et al. (2017), which will be further explained in the methodology section (Section 3.2). A selection contingency approach that emphasises logical fit without considering performance is used to analyse the alignment between all the attributes (Romero Silva et al., 2018).

Furthermore, to answer the main research question, the following sub-questions (RQ) will be addressed:

RQ 1: How is the SC structure of TWFM in Indonesia in terms of geographic dispersion and channel governance?

RQ 2: How is the alignment of the SC structure of TWFM in Indonesia to the operations strategy of TWFM?

RQ 3: How are product characteristics related to the SC structure and operations strategy of TWFM in Indonesia?

2. Literature Review

The literature review aimed to provide a comprehensive and critical overview of existing research and knowledge relevant to this research. Various streams of research were investigated to establish the context and background, laying the foundation for understanding the significance of the study. The review is to understand the methodologies and theoretical frameworks used in related studies, guiding the selection of appropriate methods for the current research. To conduct this, a systematic literature search guideline was defined in Section 2.1, and literature findings were reported in Section 2.2.

2.1. Literature Search

The literature search was conducted according to the steps by Abidi et al (2014) i.e., planning, searching, screening, and extraction/synthesis/reporting to ensure the inclusion of relevant studies on a specific topic while minimising bias. Scopus is used as the main research database. In total, there are 4 search strings (see Table 1) which formulated based on the keywords and synonyms (from Appendix A1) for every RQ. These search strings were the combination of 9 main keywords (i.e., traditional food market(s), wholesale market(s), Indonesia, supply chain structure(s), alignment, operations strategy(s), product characteristics, performance, contingency theory) and their synonyms. There are 11 inclusion and exclusion criteria (e.g. language, publication date, type of research, theoretical limit, location, and topics related to the RQs) to filter only the relevant studies (Appendix A2). The screening procedure follows the formulated critical appraisal questions (Appendix A3). Table 1 also shows the number of hits, relevant articles, and the snowballing process. Only relevant articles were further analysed.

Table 1 Search Strategy and Findings

Research Question	Search string diary	Hits	Relevant	Snow-balling	Total
RQ1: How is the SC structure of TWFM in Indonesia in terms of geographic dispersion and channel governance?	TITLE-ABS-KEY (((("supply chain*" OR "logistic*" OR "supply chain* structure*" OR "supply chain* network*" OR "supply chain system*" OR "logistic* structure*" OR "logistic* network*" OR "logistic* collaboration*" OR "supply chain* collaboration*" OR "logistic* integration*") AND ("traditional market*" OR "wet market*" OR "municipally" OR "public market*" OR "local market*" OR "food market*" OR "horticultur* market*" OR "agricultur* market*" OR "vegetable* market*" OR "fruit* market*") AND ("wholesale*" OR "wholesale market*") AND ("developing countr*" OR "Indonesia" OR "Asia" OR "South East Asia"))))	23	10	9	19

Research Question	Search string diary	Hits	Relevant	Snow-balling	Total
RQ2: What is the alignment of the SC structure of TWFM in Indonesia to the operations strategy of the TWFM?	(((("supply chain*" OR "logistic*" OR "supply chain* structure*" OR "supply chain* network*" OR "supply chain system*" OR "logistic* structure*" OR "logistic* network*" OR "logistic* collaboration*" OR "supply chain* collaboration*" OR "logistic* integration*") AND ("operation* strateg*" OR "supply chain* strateg*" OR "logistic* strateg*") AND ("alignment" OR "align*" OR "fit*") AND ("traditional market*" OR "wet market*" OR "municipally" OR "public market*" OR "local market*" OR "food market*" OR "horticultur* market*" OR "agricultur* market*" OR "vegetable* market*" OR "fruit* market*") AND ("wholesale*" OR "wholesale market*") AND ("developing countr*" OR "Indonesia" OR "Asia" OR "South East Asia"))))	13	4	0	4
RQ3: How product characteristics affect the operations strategy of TWFM in Indonesia?	(((("supply chain*" OR "logistic*" OR "supply chain* structure*" OR "supply chain* network*" OR "supply chain system*" OR "logistic* structure*" OR "logistic* network*" OR "logistic* collaboration*" OR "supply chain* collaboration*" OR "logistic* integration*") AND ("supply chain* strateg*" OR "logistic* strateg*") AND ("product* characteristic*" OR "product* qualit*" OR "product* attribute*" OR "product* differenc*" OR "product* different") AND ("traditional market*" OR "wet market*" OR "municipally" OR "public market*" OR "local market*" OR "food market*" OR "horticultur* market*" OR "agricultur* market*" OR "vegetable* market*" OR "fruit* market*") AND ("wholesale*" OR "wholesale market*") AND ("developing countr*" OR "Indonesia" OR "Asia" OR "South East Asia"))))	8	1	2	3
				Total literature	**26**

2.2. Literature Findings

From the structured literature review process, 26 relevant articles were chosen for full analysis. According to the search string, most of the research is located in Asia or developing countries. Only 2 articles come from developed countries (Brazil and Denmark), which were included because of their strong relevance to the supply chain structure and the product characteristics' effect on the supply chain.

This research focuses on the traditional wholesale food markets (TWFM), which dominate the market share of fresh fruit and vegetable retail in urban areas in Asia and developing countries. Cadilhon et al. (2006) reported that this kind of market still distributed 98% of all the tomatoes in Vietnam's urban area, despite the rise of modern competitors. Studies done in Shanghai and Northwest Ethiopia show the same results of high (80-95%) market share of the traditional market (Zhang & Pan, 2013); Yeshiwas et al., 2024). Their important role is supported by the Asian customers' preference for buying fresh food from small neighbourhood shops instead of the highly emerging supermarkets and self-service convenience stores (Cadilhon et al., 2003). Supermarkets usually focus

on packaged and processed food, which hinders them from giving consumers customised requirements (in size, quantity, and quality) as traditional markets (Goldman et al.,1999). Traditional markets can provide fresh (live and warm) items at lower cost, and better service because the vendor interacts directly with the customers (Goldman et al.,1999).

Traditional markets, which are commonly found in Asian cities, are often called wet markets, which are literally "wet" due to vegetable spraying or water from meat and fish cleaning (Zhang & Pan, 2013). The work from Zhang & Pan (2013) reported that these markets are in temporary buildings and are distinguished by their layout, with floor space divided into small stalls arranged along narrow corridors.

Some articles found focus on traditional retail markets (Nugroho et al., 2021; Zhang & Pan, 2013; Goldman et al., 1999), shifting from traditional market to supermarket (Cadilhon et al., 2006; Boselie, 2003; Reardon et al., 2003; Hu et al., 2004; Zhang & Pan, 2013) or focus in the production (farmer) side (Skinner, 1978; Midmore and Jansen, 2003; Wang et al., 2009). Meanwhile, there is limited research regarding the supply chain of the traditional wholesale market in Asia (Lemeilleur, 2014). Cadilhon et al. (2006) define wholesale markets as structured marketplaces where large quantities of food products are bought and sold, primarily for resale by retailers and food service operators rather than for direct public consumption. These markets involve two or more professional agents with different structures from retail markets.

2.2.1. Supply Chain Structure

Stock et al. (2000) tried to define SC structure, which is expressed in terms of geographic dispersion and channel governance. Knowing these factors can help characterise the supply chain of TWFM, influencing their strategy to achieve better performance.

Geographic dispersion describes the degree to which supply chain components are spread across various geographic regions (Stock et al., 2000). The geographic dispersion was examined for the suppliers and customers' side of the vendor in TWFM. **A high degree of geographic dispersion** shows that the vendor works with a **wide/broad geographically dispersed actors** (suppliers and customers).

While **channel governance** is presented in two dimensions: **(1) the vertical integration of the vendors and (2) the SC links between actors** (Stock et al., 2000). The first refers to the degree to which the market controls various stages of the supply chain, from raw material ownership to distribution, while the second includes some attributes i.e.: cooperation between supply chain, information sharing, interdependencies of actors, time horizon, formality of transaction, and degree of flexibility (Stock et al., 2000). The main reason to include this factor is that it shapes the traditional market's way of working (Bonatto et al., 2019).

2.2.1.1 Geographic Dispersion

In developing countries, terminal wholesale markets in urban areas role of ideal hubs between supply and demand and efficiently distribute fresh food (Cadilhon et al., 2003), since it is the main entry points of fresh produce to the consumer in the city (Cadilhon et al., 2006). Determining **geographic dispersion** (i.e. distance and dispersion of suppliers and consumers) is essential in shaping the supply chain of TWFM, especially in developing cities, because they cannot produce their own fresh produce and have to procure from farmers located in the suburban or peri-urban area while dealing with short shelf life along the road (Cadilhon et al., 2006; Yeshiwas et al., 2024; Midmore and Jansen, 2003; Zhang & Pan, 2013). Mila et al. (2022) reported that all the onion traders in Dhaka, Bangladesh, often rely on long-distance transportation to procure onions from other districts; nonetheless, they face difficulties in providing transport costs and storage facilities. The rise of urbanisation and infrastructure development in developing countries in Africa, Asia, and Latin America has become the main reason for the rise in medium or long-distance trade to fulfil the urban need (Reardon et al., 2003). Effective transport infrastructure is a crucial component of regional planning to guarantee connectivity between farms and markets (Cadilhon et al., 2003).

The choice of supplier location and how to transport the goods becomes the main decision at the vendor level, which will affect the transport mode and shipment choice (Nugroho et al., 2021). The majority (86.7%) of FFV wholesalers in Northwest Ethiopia are reported to use open FSR trucks (Yeshiwas et al., 2024) as well as in Greater Beijing and Shandong, China (Wang et al., 2009), Ho Chi Minh City, Vietnam (Cadilhon et al., 2006) and Indonesia (Napitupulu, 2010 and Sulihanti et al.,2005). However, there are insufficient transport facilities, i.e. cold storage or refrigerated trucks to maintain the FFV quality from the producers to the market (Mila et al., 2022; Sulihanti et al., 2005; Midmore and Jansen, 2003; Cadilhon et al., 2006). Additionally, the wholesalers do not commonly transport the produce themselves. Nugroho et al. (2021) found this pattern that the supplier is responsible for sending the produce to the market or using a third-party transportation service. Cai et al. (2013) also found that this service is popular for transporting perishable products from distant locations.

Even though Hu et al. (2004) reported that FFV in China are usually produced and consumed locally due to their perishability, some cities cannot grow their produce due to differences in the regional agroecosystem (Cadilhon et al., 2003). This could initiate demand for a distinct variety of FFV which can only be produced in specific areas (Skinner, 1978). Similarly, not every area in Indonesia can produce the same agricultural products, for the fresh produce is geographically dispersed between islands, regions, and rural and urban areas (Sulihanti et al., 2005). Moreover, Indonesia is a big archipelagic country that

consists of 16,056 islands interconnected by straits and seas (Indonesian Central Bureau of Statistics, 2024), making it challenging to distribute fresh produce between islands.

DKI Jakarta is Indonesia's capital city, which has a 660.98 km2 area, which is 0.03% of the total area of this country (Indonesian Central Bureau of Statistics, 2024). Meanwhile, the total population in Jakarta reaches 10 million people, making this province the densest in Indonesia. Providing fresh produce to Jakarta is challenging because the area itself does not have production land. Indonesian Central Bureau of Statistics (2024) reported 0 hectares of shallots and garlic production land and only 3 hectares of cabbage in Jakarta in 2023. The market demand for such FFV should be fulfilled from outside the city, as most big urban areas in developing countries (Nugroho et al., 2021; Zhang & Pan, 2013; Wang et al., 2009; Cadilhon et al., 2006; Sharma et al., 2023; Yeshiwas et al., 2024; Mila et al., 2022). This is a unique SC structure of the typical urban markets in developing countries, which buy FFV from various producers' areas to meet the demand locally. The fruit supply chain usually has a wider geographic dispersion on the supplier side than the vegetable due to its longer shelf life (Stock et al., 2000).

In summary, TWFM in the urban area in Indonesia is dispersed geographically on the supplier side, while it is focused on the customer side.

2.2.1.2 Channel Governance

As a gathering point, there are market users (actors) as defined by Yeshiwas et al. (2024) who are involved in the daily business of TWFM, namely farmers, local collectors, brokers, transporters, wholesalers, retailers, and consumers. The configurations of the type of relationship between these actors and the vertical integration of the vendors (i.e. channel governance) could affect the performance of the actor in TWFM (Stock et al., 2000; Bonatto et al., 2019; Sharma et al., 2023).

There are limited studies reported about traditional wholesalers who grow the fresh produce they sell or own a field. Most articles mentioned wholesalers are second buyers from the growers who priorly sell their harvest to small traders or collectors who supply the wholesalers (Sheperd, 2005; Sulihanti et al., 2005; Cadilhon et al., 2006; Yeshiwas et al., 2024). Only some authors reported that wholesalers directly procure FFV from the farmers (Sharma et al., 2023; Yeshiwas et al., 2024). Wholesalers rarely modify the fresh produce they get from their suppliers. They mostly transport, ventilate, store, and sometimes pack the product (Yeshiwas et al., 2024; Cadilhon et al., 2003) to add value. Other activities like sorting, grading, washing or cleaning, trimming or cutting, and labelling are usually done by other actors like farmers or retailers (Zhang & Pan, 2013; Yeshiwas et al., 2024).

On the other hand, wholesalers are the main moneybags of the FFV supply chain system (Sheperd, 2005) and gain the biggest net margin after retailers (Mila et al., 2022). Sheperd (2005) defines wholesalers as the "central point of the chain" who provide capital for the

supplier, which will supply the capital to the farmers through some system like standing crop, wholesale bulk, or loan. Not only to the upstream side, wholesalers also often provide credit or loans to retailers.

Maintaining the relationship between supply chain actors is crucial for the traditional wholesaler market to improve its performance (Bonatto et al., 2019; Paluri and Mishal, 2020). Supply chain performance is positively related to the level of trust, collaboration, commitment, and information sharing (Bonatto et al., 2019). This is confirmed by Sheperd (2005), who emphasised the essential role of *suki* or mutual relationship in Asian wholesalers, who prefer to have transactions only with their *suki* partner, both in surplus and deficit conditions. Additionally, Sulihanti et al. (2005) reported that collaboration and trust between growers, fruit collectors, inter-island traders, and wholesale markets, which have been established for years, even generations (Sheperd, 2005; Cadilhon et al., 2003), is the main driver for trading. The networks based on trust, culture, and sociological norms exist because of the lack of formal contracts between parties (Cadilhon et al., 2003; Boselie et al.,2003; Sharma et al., 2023), which Lemeilleur (2014) and Cai et al. (2013), on the contrary, found beneficial to be practised in the traditional market to secure the transactions and give more profit to the vendors.

Information sharing, communication, collaboration, and market power are the main issues in market channel governance, which result in better efficiencies (Sharma et al., 2023; Bonatto et al., 2019; Paluri and Mishal, 2020). The wholesalers will receive information about price, food quality, and delivery from the supplier, and in return, give information about market price and consumer (Sulihanti et al., 2005). The information about the order quantity and time is usually received daily in the morning before they start selling products (Cadilhon et al., 2006).

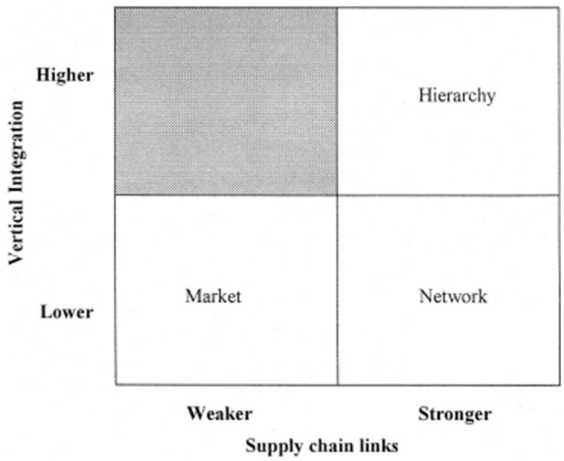

Figure 1 Channel governance configurations (Stock et al., 2000)

According to Stock et al. (2000), there are 3 main configurations of channel governance: market, network, and hierarchy, as depicted in Figure 1. The "Market" governance is marked by weak SC links and low vertical integration. An example of this governance type is retail markets who has limited resources and shallow connections between actors. On the other hand, "hierarchy" has strong supply chain links and vertical integration. This kind of governance is usually applied in big supply chain companies owning production facilities and big wholesalers with long-term partnerships. The "network" governance is a combination of low vertical integration and strong links between the SC.

The wholesale markets manage a higher volume of products and broader connections with both suppliers and customers than retail markets, so a strong relationship is needed to maintain their business (Bonatto et al., 2019). However, they should also be flexible due to market uncertainty (Niehaves and Palttfaut, 2011). Thus, TWFM in the urban area in Indonesia has a network governance system that has low vertical integration and a strong relationship between SC actors.

2.2.2. Operations Strategy

Slack et al. (2005) define operations as 'detailed, complex, concerned with day-to-day issues, and carried out by those towards the lower levels of the organisational hierarchy' while strategy is a 'broad, long-term, aggregated, and the concern of the most senior management in the business'. Operations strategy is the alignment of the internal capabilities of the organisation with its overall business strategy to ensure the effective execution of operational tasks (Qi et al., 2017).

Qi et al. (2017) distinguish 4 operations strategy components: **cost and quality** related to the product, and **delivery and flexibility** connected to the service. The same author connects these operation strategies to SC strategies: lean and agile, and the results indicate that a lean supply chain suits vendors prioritising cost, quality, and delivery strategies, while an agile supply chain is better suited for those competing on flexibility.

Ariadi et al. (2021) defined some factors that indicate **agile SC strategy**: providing customised products, supplier selection based on flexibility and responsiveness, maintaining short and flexible relationships with a large number of suppliers, supplying predictable products, and having a large capacity of inventory. While **lean SC strategy** is characterised by waste reduction in the supply chain, supplier selection based on cost and quality, maintaining long and rigid relationships with only a small number of suppliers, and implementing a 'just in time' strategy for inventory.

The research of Ariadi et al. (2021) concludes that the agile SC strategy is 'more effective in dynamic conditions than the lean SCS in stable conditions because of seasonal variation'. This aligns with Akkerman et al. (2010), who mentioned that high agility is needed to manage the supply chain of perishable products. Traditional FFV markets in developing countries face uncertainty in terms of supply and demand. The supply is highly fluctuating in availability, quality, and price (Goldman et al.,1999), while the demand is also seasonal (Tama et al., 2018). Located in the middle of the supply chain, determining suppliers, distribution, and logistic partners are important decisions for wholesalers (Sharma et al., 2023).

In Asia, Goldman et al. (1999) noted that the traditional markets are still preferred by the people due to their effective and flexible response to the customer's demand. Flexibility in the supply chain is important to respond to the market-changing requirements and

provide more effective service (Sharma et al., 2023). Distinguished from supermarkets, which provide packed food with determined quality and quantity, traditional markets can give more options for the customer's needs in terms of amounts, sizes, parts, and quality level (Goldman et al., 1999).

This result was supported by Cadilhon et al. (2006), who noted that the wholesalers are responsible for determining the product price according to the market conditions. The flexible networks are usually applied by TWFM without any contracts to secure the transactions, which increases their risk. Thus, they tend to have transactions only with their trusted partners. Table 2 was made to better understand the best fit of operations strategy to the geographic dispersion and channel governance type theoretically.

Table 2 SC Structure and the Best Operations Strategy

SC Structure	Best Operations Strategy	Supporting Literature
Geographic Dispersion		
• Widely Dispersed	Flexibility and Delivery	Geographic dispersion often leads to increased complexity (Akkerman et al., 2010) in supply chain management, which necessitates a flexible approach to operations, enabling firms to adapt their strategies to local conditions while maintaining overall efficiency (Ariadi et al., 2021; Haleem et al.,2017). Moreover, flexibility in operations allows firms to manage risks associated with geographic dispersion (Heidarzadeh et al., 2017)
• Locally Dispersed	Quality	Consumers in localised markets are more likely to prioritise quality over other factors such as price or delivery speed (Haleem et al.,2017). Additionally, businesses that emphasise quality in their operations can create a strong brand identity and customer loyalty, which are crucial for success in a competitive local environment (Li et al., 2011).
Channel Governance		
• Market	Cost	A low vertical integration can result in higher operational costs due to the need for firms to manage multiple suppliers and logistics partners without strong ties (Hamdaoui & Bouayad,2019). Besides, the dynamics of a market with weak supply chain relationships often lead to price-sensitive consumers who prioritise affordable price (Sari et al., 2021).
• Network	Flexibility	Network governance involves coordination among various participants, where the ability to adapt processes and relationships according to changes is essential for sustaining long-term performance (Luo et al., 2020). Research by Amentae et al. (2018) shows that governance structure choices significantly affect supply chain performance outcomes, with flexibility identified as a key performance indicator.

SC Structure	Best Operations Strategy	Supporting Literature
• Hierarchy	Quality	According to Nakandala & Lau (2019), integrated supply chain relationships or hierarchy governance enable operational efficiencies and proactive responsiveness to customer requirements, ultimately leading to a competitive advantage. This control facilitates the implementation of stringent quality standards throughout the supply chain, ensuring that products meet or exceed customer expectations (Luning and Marcelis, 2006)

If the supply chain structure of traditional wholesale food markets (TWFM) in Indonesia is confirmed to be geographically dispersed and governed through network-based coordination, then a flexibility-oriented strategy is likely to be the most prevalent among vendors, aligning with the principles of supply chain agility under network governance (Christopher & Peck, 2004).

2.2.3. Product Characteristic

FFV has a special characteristic, which is **perishable and has seasonal demand** (Midmore and Jansen, 2003; Tama et al., 2018). This special characteristic can uniquely mould the market dynamics and demand, which determines the strategy made by the vendors (Zhang & Pan, 2013; Cai et al., 2013). Sulihanti et al. (2005) said that the price of a product is determined by its variety and availability. Moreover, Akkerman et al. (2019) stated that high agility and flexibility are needed to manage perishable products that quickly move. A product with seasonal demand as FFV has a higher risk of being wasted if not sold on time, thus, the calculation of its order quantity is based on the balance between overstock and understock cost (Tama et al., 2018). Additionally, the **short shelf life** is also noted to affect the payment system, for instance, the amount of credit needed (Sheperd, 2005).

The **absence of storage facilities** for perishable products in developing countries has become a crucial issue, noted by Mila et al. (2022) and Midmore and Jansen (2003). Whereas, the product quality decreases quickly without adequate cooling facilities (Sulihanti et al., 2005). Regarding temperature control, Akkerman et al. (2010) differentiate 3 types of supply chains: frozen, chilled, or ambient. Cadilhon et al., (2006) observed that the expectation of fresh food for Asian consumers is 'as close as possible to the live animal or plant', thus making chilled or frozen FFV is not preferable. FFV vendors usually use simple ways to extend the shelf life, such as cleaning or spraying water constantly (Zhang & Pan, 2013). Some vendors also modify (lower) the price for reduced quality vegetables to make it sold quickly, avoid spoilage loss and maximize the vendors' profit (Cadilhon et al., 2006; Wang and Li, 2012).

Some studies differentiate their analysis of traditional wholesale markets based on the product types (tomato and cucumber by Wang et al., 2009; cauliflower and tomato by Sharma et al., 2023). **The decision made by the vendors usually depends on the product type** (Nugroho et al., 2021). Bask and Tinnilä (2013) highlight that product-related characteristics dictate how supply chains are structured and managed, affecting various stages from raw material sourcing to distribution. Product variety and quality influence the sourcing location and mode of transportation, and eventually transportation cost (Sharma et al., 2023; Skinner, 1978; Boselie et al., 2003). Therefore, product characteristics might influence the SC structure and operations strategy of TWFM in Indonesia.

3. Research Methodology

Structured interviews with the TWFM vendors were conducted to answer the research questions. This section will describe how we plan and conduct structured interviews to answer the research questions. This method enabled vendors to provide detailed responses while maintaining a structured framework, ensuring the interviews remained focused (Brinkmann, 2014). This section explains how the interviews are conducted, starting from the preparation (section 3.1), research framework explanation (section 3.2), interview guide and structure (section 3.3), and data analysis (section 3.4).

3.1. Preparation

3.1.1. Selecting Market Type and Interview Location

Cadilhon et al., 2006 distinguished TWFM into two types: assembly markets which gather fresh produce in rural producer areas, and terminal markets in urban consumer areas which receive bulk products and repackage them into smaller sizes for the final customer. The focus of this research is on the terminal market in urban areas. Horticultural products will be further examined instead of processed food or other kind of fresh produce since they represent perishable food products. Therefore, Kramat Jati Wholesale Market or *Pasar Induk* Kramat Jati (PIKJ) is chosen as the research location because it is the biggest horticultural wholesale market in Jakarta, the capital city of Indonesia, which represents the typical TWFM in the urban area in Indonesia.

PIKJ is focused on distributing fresh fruits and vegetable products, which involves 4500 traders, 2.000 employees, and more than 20.000 visitors per day (Informatics and Statistic of East Jakarta Municipality, 2022). According to the standard set by Lemeilleur, (2014), PIKJ is categorised as a large wholesaler market with more than 20,000 tons of transactions per year, with total transactions of 1400 tons of vegetables/day and 1500 fruits/day (Napitupulu, 2010).

3.1.2. Defining products

To answer RQ3 of how product characteristics affect the operations strategy, various types of fresh produce, which are assumed to represent variative structures of the fresh produce supply chain, i.e., shallot, garlic, oranges, and cabbage, were involved in this research. Shallot was assumed to represent a product originating from local farmers, which has a short shelf life. It is known to be planted mostly in Java Island, which is the same island as PIKJ (Napitupulu, 2010). On the other hand, garlic is generally imported from China, India, Taiwan and the United States (in total 94% of the national demand) since Indonesia cannot produce it massively (Saptana et al.,2021) Garlic has a longer shelf life than shallot and represents the supply chain of imported products. Orange was chosen since it can be sourced locally or imported (Napitupulu, 2010). Orange also represented the seasonal fruit supply chain. Cabbage became the last commodity, which represented a perishable vegetable commodity that produces a massive amount of waste in the wholesale market (Eriyatno et al., 2024).

3.1.3. Vendor Section and Recruitment Procedure

Generally, there are three types of vendors in PIKJ: wholesalers, big retailers, and retailers. The interviews involved 12 wholesale vendors of 4 products (3 vendors per product). The wholesalers or dealers, which are the focus subject of this research, get the product directly from the suppliers/ farmers/importers outside the market. Usually, they are the ones who are economically able to procure large-scale fresh produce and act as the price makers (Cadilhon et al., 2006).

The research also involved the retailers who directly buy products from the selected vendors to measure their performance. They were selected after the interview with the first group was conducted. Only one retailer per vendor was involved in the research due to limited time and resources. Moreover, a unique pattern was found that one retailer can buy products from multiple vendors in the same commodity group. Therefore, the performance analysis and measurement were conducted per commodity to reduce the bias of this limitation (Pingali et al., 2005).

3.1.4. Interview Period

The research was done in November 2024. It is essential to note the period of this research because of the highly seasonal nature of FFV production. The timing of the survey directly affects the variety of fruits and vegetables available in the market, as well as their sources (Napitupulu, 2010).

3.2. Research Framework

To structure our study, we use a conceptual framework (see Figure 2). This framework is a modification of the proposed framework by Stock et al. (2000), which was originally used to examine the alignment between SC structure with the logistic integration of a firm. We modify the logistic integration part of the operational strategy (Qi et al., 2017) to make it more contextual. The research by Stock et al. (2000) focused on the logistics firms that have advanced SC management (e.g., they have an SC manager or division that understands the strategy they apply). Meanwhile, the general data about the interviewees in this research shows that 11 out of 12 vendors are not familiar with supply chain management. Therefore, a question about strategy at the operational level is a better approach for TWFM.

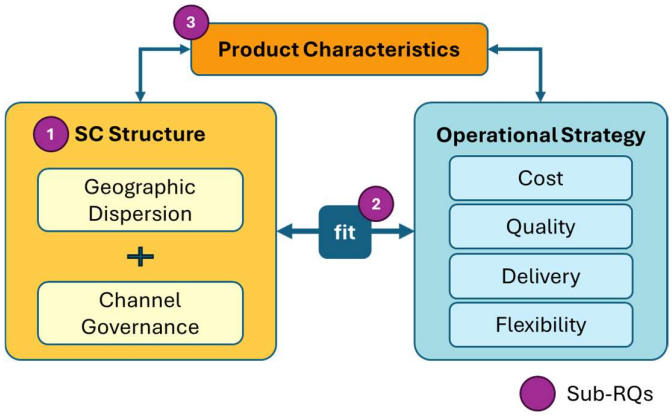

Figure 2 Research Framework

3.3. Interview Guide and Structure

Based on the research framework, structured interview questions were arranged to get relevant answers from the wholesale vendors in TWFM. This section provides the general structure of the Interview questions, while the full version is available in Appendix B.

Interview Questions Overview

General Questions

This part consists of information about the interviewee, their position and role in the TWFM, years of working, type of product they sell.

Part A. Supply Chain Structure

According to the framework, supply chain structure is characterised by geographic dispersion and channel governance. Thus, this section will first gather information related to the location of the supplier and customers of the vendors, the range of their

business, transportation methods, lead time, and infrastructure to maintain the quality (freshness) of the products.

Furthermore, the type of channel governance will be examined through some questions about vertical integration, which is indicated by whether the TWFM owns the production or supply chain facilities. Some questions about cooperation between supply chain, information sharing, interdependencies of actors, time horizon, formality of transaction, and degree of flexibility (Stock et al., 2000) will be asked to know the nature of links with the supplier and customers.

Part B. Product Characteristics

In this part, questions about the product's shelf life, availability, volume, and quality of the received product (Luning and Marcelis, 2006) will be asked.

Part C. Operations Strategy

The strategy prioritised by the vendors in the TWFM will be identified by a ranking test within four operations strategies: cost, quality, delivery and flexibility (Qi et al., 2017). Then, their reasons for taking the strategy were also asked.

Part D. Performance

Some questions about the performance measurement (Aramyan et al., 2006), which includes efficiency, flexibility, responsiveness, and food quality, were asked to get additional information that may explain their strategy choices. The attribute of efficiency is translated into questions about distribution cost, profit, and inventory, which will be asked of the vendors. While the other 3 attributes will be converted into a 1-9 Likert scale and will be answered by the consumers of the vendors (Appendix II). Lastly, a question about the amount of waste produced per day by the vendors is included in the interview.

3.4. Data Analysis

3.4.1. Transcribing and Translating

The interview results were in the Bahasa Indonesia language. They were first transcribed and translated manually and then inserted into a Microsoft Excel table for analysis.

3.4.2. Interviewee and Answer Coding

Each response from the vendors was assigned a code based on the commodity (n = 4), vendor (n = 3), and question number from the interview question (n = 43). The commodity codes were as follows: shallot (BM), garlic (BP), cabbage (KL), and orange (JR). For example, a response from the third shallot vendor to question number 20 would be coded as '*BM03-20*.' The code without the question number (e.g., BM03) refers to the vendor (e.g., shallot vendor number 3).

3.4.3. Qualitative Data Analysis

The interview analysis using Microsoft Excel is presented in the 'Qualitative Data Analysis' table (Appendix C), which was inspired by the practical steps of Grounded Theory by Lacey and Luff (2001). The objective of this analysis is to get comparable categories that help to develop a theory and to find the relationship between categories (Lacey and Luff, 2001). Firstly, the vendor's answer for every interview question was extracted as **literal answers**. Then, the key terms or **unit of analysis** were determined for each literal answer to every question. For example, the unit of analysis of the answer to the first question from IQs 1: '*Where do you get the fresh produce? '* is '*Supplier's location*'. The next step is highlighting keywords and their context in the **context unit** column. The **core meaning** was then determined, followed by **categorised** expert opinions.

Afterwards, the categorised answers were used to code documents using Atlas.ti. This process aimed at mapping the answer per unit of analysis for every topic and every vendor interviewed (Lacey and Luff, 2001). Code-document analysis was then conducted to compare the codes with documents or codes with document groups (per commodity). The data was then extracted to Microsoft Excel for measurement and presentation (table or graph).

3.5. Variables and Measurements

3.5.1. Geographic Dispersion

Distance and dispersion are the main variables in **geographic dispersion** measurement (Stock et al., 2000). The first variable was calculated by averaging the distances of the locations (of suppliers and customers) to the PIKJ. Locations situated more than 500 km away are classified as 'wide,' whereas those within 500 km are considered 'local'.

Besides the distance, the locations are also classified into three groups: a) same province (locA); b) different province in the same island (locB); and c) different islands (locC). If the product is imported through importers, the importers' locations will be considered as the sourcing location.

Afterwards, we calculate the percentage of each group based on the mentioned frequency for the same commodity. For example, for shallot, "Brebes" were mentioned as the supplier location of vendor BM01 and BM03, then it will be counted twice. The calculations were done separately for suppliers and customers' locations.

The geographic dispersions (DISP) variable was calculated using an adopted formula from Stock et al. (2000) as follows:

$$DISP = 1 - \frac{[|locA\% - 33\%| + |locB\% - 33\%| + |locC\% - 33\%|]}{133\%}$$

The variables resulted in the range from 0 to 1, where a value of 0 indicates complete concentration within a single location group, and a value of 1 reflects an even distribution

across all four location groups. If DISP > 0.5, we define it as a nationally dispersed structure, while DISP $\leq$ 0.5 is concentrated or focused. In the case of perfect uniformity, each group would account for 25% of the total. Conversely, if only one group were represented, it would hold a value of 100%, while the other groups would register at 0%.

3.5.2. Channel Governance

According to Stock et al. (2000), there are 2 dimensions of measuring channel governance: **vertical integration** and the **relationship/link between SC actors** (see Figure 1). The first one was measured using 2 variables: product ownership and modification process, showing the extent to which the vendors owned the production or SC facilities. Meanwhile, there are 6 variables for the relationship between SC actors named cooperation, interdependencies, information sharing, ongoing transactions, flexibility, and informal relationships. These variables are applied on both the suppliers' and customers' sides.

Every variable mentioned has different categories, and a weighted score (1-3) based on how relevant a category is to the variable was applied for all the variables (see Appendix D2). A weight of 1 is low, 2 is medium, and 3 is strong. For example, in the 'product ownership' variable, 1 means *'buy a harvested product',* showing low product ownership, 2 means *'contract farming',* showing medium product ownership, and 3 means *'own farmland',* showing strong product ownership. The average weight of each commodity was then categorised and analysed in the same way.

"*Market*" governance is indicated by low vertical integration and weak relationships between actors, while "*network*" governance has low vertical integration and strong relationships between SC actors and "*hierarchy*" governance has both high and strong for the two dimensions.

3.5.3. Operations Strategy

The operations strategy is investigated by measuring 4 variables: delivery, flexibility, price, and quality. The vendor was asked to rank the variables (1-4) based on their priority in decision-making. Rank 1 is the most prioritised variable, while rank 4 is the least prioritised. The rank for each variable was then averaged per commodity to define the operations strategy. Full data and analysis are provided in Appendix D3.

The best-fit strategies were based on the Literature in Table 2. The reasons for applying a particular strategy (answer for question number 28) and the additional relevant conditions explained by the vendors were also used for deeper analysis.

3.5.4. Product Characteristics

The variables of product characteristics in this research are origin (local or imported), availability (all year long or seasonal), shelf life (time in the store), cold storage facilities (available or not), product form (packed or bulk), and modification process. The result

from the qualitative data analysis was directly used to classify each variable. Additionally, there is some additional information about product volume and demand, but it is excluded.

3.5.5. Contingency Approach

The selection contingency approach was used to test the relationship among all variables. The approach was used and not the interaction and system approach, since the alignment in this research is based on the logical fit and not the performance (Romero-Silva et al., 2018). The data and time limitations of this research were the main factors in not choosing the other approaches. Questions about performance (Part D) were considered as additional information. However, measuring performance and using the system approach in the same field is expected from future research (Sousa and Voss, 2008).

4. Results

4.1. Products Overview

Before mapping the supply chain structure and operations strategy, we investigate 6 variables of product characteristics (i.e. origin, availability, shelf life, cold storage facilities, product form, and modification process) for every commodity. Table 6 shows the summary of the characteristics of every commodity, and further explanation will be provided in this Section.

Table 3 Product Characteristics Overview

Variables	Shallot	Cabbages	Garlic	Oranges
• **Origin**	Local	Local	Imported	Local and imported
• **Availability**	All year long	All year long	All year long	Seasonal
• **Shelf life (time in the store)**	1-3 days	1-3 days	1 week-3 months	4-7 days
• **Cold storage facilities**	No	No	Yes	Yes
• **Product form**	Packed	Bulk	Packed	Packed
• **Modification**	No	Simple	Simple	No

Shallot

Shallots are mainly grown in Central, East, and West Java due to favourable agro-climatic conditions (Krismiratsih et al., 2024; Hidayah et al., 2023). Their distinct flavour makes them popular for culinary use (Pangestuti et al., 2022). Shelf life varies from weeks to months, depending on genetics, storage, and post-harvest handling (Ansar et al., 2022).

At PIKJ, shallots are stored for a maximum of 1–3 days (n=3) but remain available year-round due to alternating harvests across regions like Demak, Purwodadi, Pati, Nganjuk,

and Bima. Vendors source from multiple regions to ensure supply and sell not only to Jakarta but other urban areas like Lampung and Bangka Belitung, where shallot production is absent. The wholesalers in this matter are gathering points where the product transits before it is sent to the final market.

Figure 3 (a) Shallot Packaging; and (b) usage of fan to maintain quality

Shallots are packed in 60–70 kg sacks (see Figure 6a), with vendors handling 4.2–49 tons per day to meet the fluctuating demand (n=3). Quality indicators include bright red color, freshness, dryness, and large size. Vendors sell shallots in their original supplier packaging, reflecting low vertical integration.

To maintain quality, vendors use fans to reduce humidity (*BM03-25*; see Figure 6b) and aim to sell products within a day to avoid shrinkage and price drops (*BM02-25*). With no storage facilities at the market (n=3), cold storage is used only for inter-island shipping (*BM03-26*). Given these conditions, a flexibility strategy is essential for business sustainability.

Cabbages

Cabbages have a similar characteristic to shallots. They have a short shelf life, around 1 to 3 days at the store. Cabbage is generally grown in highland areas, where the altitude and cooler climate help enhance its quality and yield (Ghiffar et al., 2025). The vendors confirmed that they buy cabbages from various highland areas, alternately according to different harvesting periods (n=3).

Figure 4 (a) Bulky cabbage; (b) Peeling process; (c) Waste caused by the peeling process

The main difference between shallots and cabbages is the product form and modification, whereas cabbages are usually transported in bulk without packages with 6-7 ton capacity trucks (Figure 8a). One vendor can order 6-25 tons a day to fulfil fluctuating demands. Good quality cabbages have a pale green colour, a round, flat shape, are dry, and weigh around 1.5 kg per piece. The vendors maintain their quality by peeling the outer layer (n=3), which results in the loss of 300-500 kg per truck (*KL01-43; KL03-43*) (Figure 8b and c). This specific characteristic made the vendors choose the quality strategy (n=2).

Garlic

Imported garlic has a longer shelf life than local vegetables—up to one week at room temperature (n=3) or three months in refrigerated storage, which is available only to importers (BP01-20).

Figure 5 (a) Garlic Storage; (b) Garlic Vendors sell various products; (c) Refrigerated container transporting garlic

Garlic is packed in 20 kg sacks (Figure 7a). Unlike specialised shallot vendors, garlic vendors commonly sell other spices and act as retailers, offering smaller portions to individual customers (Figure 7b). This explains their additional processing (cleaning and peeling), which is done at the retailer level. Due to fluctuating demand, vendors handle

2–10 tons daily, but procurement occurs only once or twice a week (*BP01-22*) according to the stock level.

High-quality garlic is firm, round, white, and free from black spots. While BP01 enforces strict quality control, other vendors accept all grades and price them accordingly, aligning with a quality-based strategy.

Oranges

Orange has various types with different characteristics. It was identified that there are local oranges like Medan oranges and Malang oranges, and imported oranges from Australia (Murkot), China (Santang), Africa, and America (Sunkist). Thus, they are dispersed geographically. Each vendor usually specialises only in one type, either local or imported.

Figure 6 (a) Local orange; (b) Various imported oranges; (c) Small fruit stalls

Local orange is usually kept in store for 1-3 days, while the imported ones stay longer, up to 4 days. They are packaged in either boxes or crates, with various capacities from 7-15 kgs according to their type. Oranges are known as a seasonal product. Interestingly, the orange vendors usually alternate between other types of oranges or other fruits based on the season. For example, when the research was done, JK02 sold mostly Santang oranges from China because there was a high demand near the Chinese New Year period (Figure 9b). Vendor JK03 did not even sell any oranges at that time due to the harvesting time of other local fruits: mango and dragon fruit. This fact underscores their pricing strategy, which is fundamentally driven by market demand.

Good quality oranges have a clean and fresh look, a firm grip, and a bright colour. To maintain this quality, 1 out of 3 vendors has cold storage facilities. Meanwhile, JK01, who focuses on Medan orange, does not use refrigerators on purpose. *"Medan oranges do not require cold temperatures, as long as it is still covered in the packaging at room temperature and not exposed to heat, they can last up to 1 month"* (*JK01-25*).

4.2. Supply Chain Structure

4.2.1. Geographic Dispersion

From the interviews, all the mentioned suppliers and customers' locations were analysed to calculate the percentage of every location group. The calculations were attached in Appendix D1, and Figure 3 shows the percentage of suppliers' and customers' locations for each commodity.

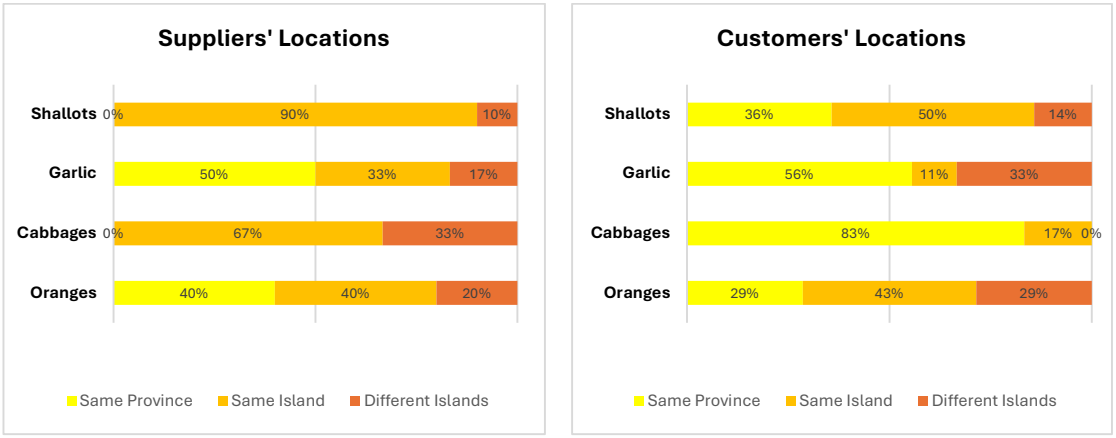

Figure 7 The Percentages of (a) Suppliers and (b) Customers' Locations per Commodity

The result of dispersion (DISP) and the average distance of location from PIKJ (DIST) were presented in Table 4. The summary of the type of geographic distance and dispersion matrix is shown in Figure 8 and Figure 9 is a heat map illustrating the distance and range between suppliers and customers from PIKJ.

Table 4 Geographic Dispersion and Distance Average of Suppliers and Customers per Commodity

Commodities	Distance (DIST)		Dispersion (DISP)		
	Suppliers	Customers	Suppliers	Customers	Total
Shallots	720.29	188.63	0.15	0.71	0.43
Garlic	939.33	247.88	0.75	0.67	0.71
Cabbages	942.50	12.40	0.50	0.25	0.37
Oranges	733.60	472.50	0.80	0.86	0.83
Average	**833.93**	**230.35**	**0.55**	**0.62**	**0.58**

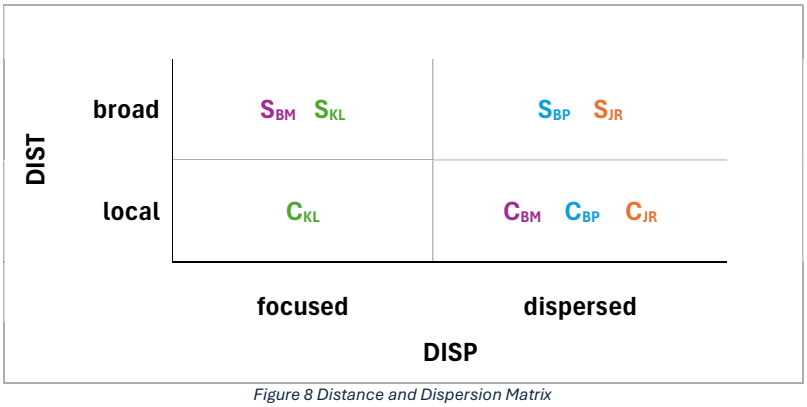

Figure 8 Distance and Dispersion Matrix

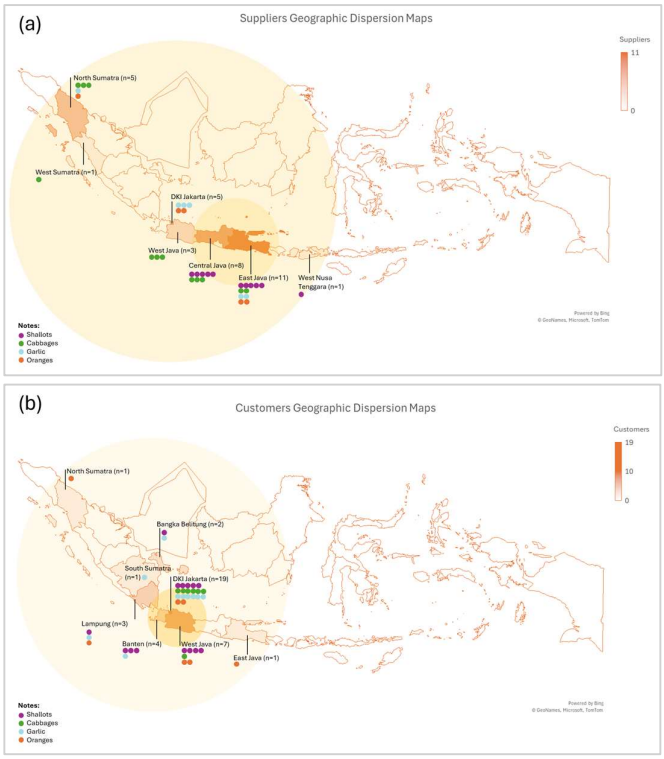

Figure 9 (a) Suppliers and (b) Customers Geographic Dispersion Map

Overall, the result shows that the average distance of the suppliers ($DIST_{SUP}$= 833.93 km) is further than the customers ($DIST_{CUS}$= 230.35 km). This shows that the vendors source their product from different places and sell it locally. Uniquely, the geographic dispersion of the customers ($DISP_{CUS}$= 0.62) is higher than the suppliers ($DISP_{SUP}$= 0.55), with the total (average) dispersion of 0.58. The result is more than 0.50, showing a dispersed structure of the market supply chain.

4.1.1.1 Suppliers' Location

The findings indicate that 90% of the shallot suppliers are located in different provinces on the same island. Shallots mostly come from Nganjuk, Brebes, Sukomoro, Demak, Pati, and Purwodadi. Only one vendor (10%) buys shallots from Bima, West Nusa Tenggara, which is on different islands (BM02). This resulted in a more concentrated source from Java Island ($DISP_{BM}$= 0.15), with the average distance from PIKJ 720.29 km. This is categorised as a **broad-focused** structure.

Cabbage shows similar **broad-focused** characteristics ($DISP_{KL}$= 0.50) where the vendors procured it from outside the province, 67% from Java Island and 37% from different islands. The cabbage comes mostly from cold areas (*KL01-01*), like Bandung, Dieng, Jember, and Malang. However, all the vendors are shown to have the same alternative suppliers from Medan, which is located on different islands, with a distance of 2,001 Km. Vendors KL03 and KL02 explained that this scenario would happen if the product is out-of-stock (*KL02-01*) and the product from Medan tends to be available all year long and is better in quality ('it is dried so it is not easily damaged on the way') (*KL03-06*). This scheme results in an average distance of 942.50 km from PIKJ.

In contrast with shallot and cabbage, which have 0% local suppliers, the garlic suppliers are mostly importer companies, which are located inside the province (50%), i.e. near the port in Tanjung Priok, North Jakarta, and West Jakarta, as the main port of imported goods coming to Indonesia. Some garlic vendors reported garlic from Surabaya (33%) and Medan (17%), which are also near the entry port of imported goods. Garlic is ordered from importers in Medan occasionally, only when it is scarce (*BP02-01*). This scheme results in a high dispersion value of garlic ($DISP_{BP}$= 0.75), showing that the sourcing is **broadly distributed** from different location groups.

Orange seems to have various origins inside the country ($DISP_{JR}$= 0.80). Usually, each vendor focused on one type of orange: local or imported. From the interview, 40% of suppliers are importers, which are located around Jakarta, 40% are local oranges from Java Island (Malang), and 20% are local oranges, specifically from Medan (a different island).

Generally, a 6–7 ton cold diesel truck is the most common transport mode (n=12), though seven lack refrigeration. Refrigerated trucks '*thermoking*' are used for shipments from outside Java due to higher costs (*KL01-08, KL03-08*). Containers (20 tons) and ships are rarely used. Vendors use containers only when supply is high, while ships are a last resort when stock runs out. Air shipping is avoided due to high costs, except for perishable fruits like grapes (*JR02-03*).

The transportation time varies between less than one day for short distances (under 500 Km), 1-4 days for long distances inside the country (500-2000 Km), and more than a week for imported goods. This connectivity is reported to be better than 20 years ago due to the

better road infrastructure, which aligns with previous research (Reardon et al., 2003; Cadilhon et al., 2003). Vendor JK02 said that they need 7 days of transport time from Australia, 14 days from China, 30 days from America, and 40 days from Africa.

Vendors do not transport products themselves but rely on third-party services (n=10) or suppliers (n=5) to transport the product from the supplier. Most products come directly from suppliers to PIKJ without transit (n=8), but imports like garlic and oranges are first stored in importers' warehouses (n=4).

4.1.1.2 Customers' Geographic Dispersion

The customers' locations are generally closer to the market ($DIST_{CUS}$= 230.25 km) than the suppliers' locations ($DIST_{SUP}$= 833.93 km). Cabbage has the closest average distance of 12.40 km from the market. However, customers' location is highly dispersed, with the $DISP_{CUS}$= 0.62. This shows that the products are sold locally, but vary through the different location groups. All the commodities have a similar local-dispersed characteristic except for cabbages that has local-focused structure.

Cabbage and garlic vendors mostly sell their products within the same province (83% and 56% respectively). Most of the customers are retailers inside the market. Shallot and orange customers are also located inside the province (36% and 29%), but they mostly sell the product to other nearby provinces (50% and 43%), which are Jakarta, Bogor, Depok, Tangerang, and Bekasi (*Jabodetabek* area). PIKJ acts as a distribution hub that supports other wholesale markets in Tangerang and Bogor, along with smaller markets within a 50 km range.

The buyers commonly come directly to the store to pick up the product or use a porter service to take orders (inside the market). No vendor delivers the product to the customers, except for long-distance sales, for example, shallot vendors who supply to Sumatra, including Lampung (n=3) and Bangka Belitung (n=2).

4.2.2. Channel Governance

Table 3 shows the channel governance configurations of each commodity and the total or overall channel governance category. All commodities show the same pattern of low vertical integration and medium-strong relationship between SC members.

Table 5 Channel Governance Configurations

Dimensions	Shallot	Garlic	Cabbage	Orange	Total
Vertical Integration	Low	Low	Low	Low	Low
Relationship between SC members	Medium-Strong	Medium-Strong	Medium-Strong	Medium-Strong	Medium-Strong
Channel Governance Type	**Network**	**Network**	**Network**	**Network**	**Network**

4.1.2.1 Vertical Integration

The result shows that all the commodities have low vertical integration due to low results in product ownership and limited product modification. Low product ownership was indicated by a characteristic of buying harvested produce (n=12) and not owning farmland (n=0) or directly having a contract with the farmers (neither in the form of a standing crop system nor wholesale bulk) (n=0). Furthermore, most vendors do not modify the product (n=6) or only do simple modifications (n=6) such as sorting, grading, weighting, repacking, cleaning, and peeling.

The modification process differs for each commodity for various reasons. Shallot and orange vendors do not modify the product to prevent shrinkage (*BM01-10, BM03-10*) and avoid additional costs (*BM03-10*). For these commodities, the modification process is done by other actors, for example, the suppliers clean and sort the products before being delivered to the wholesale markets (*BM02-10, JR03-10*), and the retailers are responsible for weighing and sorting them (*BM01-10*). Moreover, the buyers are familiar with the original form of the products (*BM02-10*), and that is the custom of wholesale markets (*JR02-11*).

Garlic and cabbage vendors simply modify the product, which includes processes like cleaning and peeling. These simple modifications are usually done by the vendors themselves (n=6) without intervention from third parties (n=0). The process is usually done to fulfil consumer demands. For example, there are 2 types of garlic, named *Honan* and *cutting*. Some customers demand the original, cleaned, or peeled version, all with different usage and price (*BP01-11*). *"Every version of honan garlic has its price and consumers. The price of the original honan is IDR 34750/kg, cleaned is IDR 36000/kg, and peeled is IDR 39000/kg. The original cutting type price is IDR 39000/kg because it has a strong flavor" – (BP01-11)*. Furthermore, modifications are made to preserve product quality. For instance, peeling the outer layer of cabbage removes dirt, enhances cleanliness, and improves its overall appearance (*KL01-11, KL02-11, KL03-11*).

4.1.2.2 Relationship between SC actors

While having low vertical integration, the TWFM vendors maintain a strong relationship between SC members, which was measured using six variables. Vendors' cooperation strength is reflected in their supplier and customer numbers. Generally, all vendor has fewer suppliers (10–50 per vendor) than customers (10–200 per vendor). This shows PIKJ as a terminal wholesale market and not an assembly one (Cadilhon et al., 2003). Supplier types include collectors, importers, and farmers. However, farmers who sell in small quantities lead to higher prices due to transportation costs, thus making it unsustainable (*BM02-13*). On the other hand, customer types vary widely: retailers, other wholesale markets, supermarkets, restaurants, food factories, and street food vendors.

Furthermore, vendor-supplier and vendor-customer relationships show medium interdependency. Securing suppliers depends on trust, subscriptions, and availability, with some vendors finding it easy (n=5), difficult (n=5), or situational (n=2). In Asian culture, trust is key—once lost, recovery is nearly impossible. *"They (the importers) are smart and careful people, they usually survey my business without me knowing (spying) to see if I am trustworthy or not,"* (*BP02-14*).

The communication or information sharing impacts the trust they build with the other supply chain actors. This variable was measured by considering to which party they share information and how they share it. Weak sharing occurs when vendors limit communication to suppliers (n=3) and use minimal channels like phone calls and WhatsApp (n=4). Strong sharing involves updates on supply, stock, prices, and orders via WhatsApp groups (n=2) and status updates (n=2), with one vendor even using a website (*JR01-15*).

All the vendors similarly applied flexible transactions with the suppliers and customers (n=12). Flexibility means the 'organisation's ability to effectively adapt or respond to change' and is a result of environmental uncertainty (Vickery et al., 1999). The interview result confirmed that flexibility is due to highly fluctuating market conditions. *"Every day, even every hour, the price can be different"* (*BM01-34*).

To secure the business in uncertain conditions, some vendors apply a subscription system with the suppliers that happens informally and is based on loyalty. Sometimes, they prefer maintaining loyalty rather than getting temporary profit (*JR01-29*). Changing the subscription is '*impossible'* (BM01-13) and sometimes costs money (BM03-14). Furthermore, this system aims to maintain loyal customers who are reliant on product availability and quality. This subscription system also allows continuous transactions between vendors, suppliers, and customers (suppliers n=7, customers n=6). On the contrary, some vendors apply occasional or one-time transactions to avoid commitment so they can get the best deal for every purchase in the competitive market (*BP02-29*).

The vendors mostly apply informal transactions (n=10). Written contracts (i.e., formal transactions) are rare, except for high-value transactions (*BP01-31*) or food company orders (*BP02-32*). This formal transaction obligates the vendor to exceed the weekly and monthly demands of the customer to prevent a penalty (*BP02-32*).

4.3. Alignment with Operations Strategy

From the ranking test analysis, the average ranking for each commodity and the total priority are shown in Table 5. In general, product quality becomes the top priority, which is consistent across all the commodities (avg 2.00±0.50), followed by price (avg 2.25±0.19), flexibility (avg 2.75±0.19), and delivery (avg 3.50±0.25). Transparency is an additional variable mentioned only by the orange vendor JR01, ranked as the last priority.

Table 6 Operation Strategy Configurations

Operations Strategy	Average (Avg) Rank				Avg	Rank
	Shallots	Garlic	Cabbage	Orange		
Delivery	4.00	4.00	3.00	3.33	3.50	4
Flexibility	1.00	3.00	2.67	4.33	2.75	3
Price	2.00	1.67	2.67	1.67	2.25	2
Quality	3.00	1.33	1.67	2.00	2.00	1
Transparency	a/n	a/n	a/n	3.67		5
Overall Priority	**Flexibility**	**Quality**	**Quality**	**Price**	**Quality**	

Looking at the relation with the products, a quality strategy is applied by garlic and cabbage vendors, while shallot vendors prioritise flexibility, and orange vendors consider the cheapest price as the best option. The theoretical alignment between these strategies with the SC structure is depicted in Table 5.

Table 7 Alignment Between SC Structure and Operations Strategy

Commodities	SC Structure	Operations Strategy	Theoretical Alignments
Shallots	Focused	Flexibility	**Unfit**
	Network	Flexibility	**Fit**
Garlic	Dispersed	Quality	**Unfit**
	Network	Quality	**Unfit**
Cabbage	Focused	Quality	**Fit**
	Network	Quality	**Unfit**
Oranges	Dispersed	Price	**Unfit**
	Network	Price	**Unfit**

Shallot vendors (n=3) prioritise flexibility, aligning with their dispersed SC structure and network governance. As commission agents, they accept all shallots, sell based on market conditions, and earn commissions per agreement. Therefore, they value strong supplier and customer relationships that help them negotiate better prices. *"Because with suppliers who understand the market situation, it will be easier for us to get commission regardless of the situation"* (*BM02-28*).

Meanwhile, garlic vendors focus on quality (n=2) and price (n=1). This aligns with their SC structure, which is locally dispersed (or focused) but unfit for the network channel governance they applied. Even though the garlic comes from abroad, their suppliers are mostly located in the same province as their customers. Applying a strategy focused on quality is the best fit for this situation. Vendor BP03 notes that price follows quality, and

BP02 emphasises that resellers prefer high-quality products. Even vendor BP01, which prioritises price, enforces strict quality control. *"Every incoming material, we usually take 3 samples (per 400 kg) to check the quality before accepting it."* (*BP01-25*).

Cabbage vendors prioritise quality (n=2) and delivery (n=1) despite their dispersed SC and network system, which is theoretically unfit. The drawback of this is that the product price will be high. However, vendor KL03 justified that they are known to have a good quality product, even though the price is high (*KL03-29*). KL01 supported this by saying that they get better profit for serving good quality products (*KL01-28*). Sousa and Voss (2008) describe this character of practice as 'panacea', which is when ineffective practices are chosen to be used frequently because the practices are strongly determined by contingencies or uncertainty.

Orange vendors focus on price (n=2), unfitting their SC structures. However, strong SC relationships allow them to secure the best prices, and high turnover ensures faster sales. This aligns with the vendor JR01, who strongly prioritises transparency. They need trustworthy connections with all related stakeholders to get more profit and avoid risk. *"The collaboration between suppliers and buyers is very important not to harm each other"* (JR01-28).

Delivery is the lowest priority for most vendors, except KL02, due to improved road infrastructure and consistent stock availability compared to years before (*BM01-27*). However, KL02 still prioritises delivery to ensure constant product availability.

In summary, the ***SC structure does not influence the operations strategy***. The influencing factors will be discussed in Section 5.

5. Discussion

The products are widely sourced but locally distributed

Pasar Induk Kramat Jati (PIKJ) is the biggest terminal wholesale market and is the main entry point of FFV to Jakarta from various sources. This indicates a wider geographic distance of the suppliers than customers (Nugroho et al., 2021; Zhang & Pan, 2013; Wang et al., 2009; Cadilhon et al., 2006; Sharma et al., 2023; Yeshiwas et al., 2024; Mila et al., 2022). This is supported by the result of this research, where the average distance of the suppliers ($DIST_{SUP}$= 833.93 km) is further than the customers ($DIST_{CUS}$= 230.35 km).

However, the geographic dispersion of the customers ($DISP_{CUS}$= 0.62) is higher than suppliers ($DISP_{SUP}$= 0.55). There are some reasons found to explain this. Firstly, it is related to the product characteristics. Agriculture products are grown or produced in specific areas, which are often far from the cities (Zhang & Pan, 2013). For example, the shallots need to be grown in a lowland, with specific agro-climate conditions (Krismiratsih et al., 2024; Hidayah et al., 2023), while cabbages, on the other hand, prefer

highland with cooler temperatures. This condition makes a more concentrated source of FFV. Bosilie (2003) suggest a dispersed sourcing and flexible strategy to spread the risk effectively. However, this will cost money (JR03-14) as the TWFM has a strong relationship between SC actors.

The second reason is the role of PIKJ as an agricultural product distribution channel (Majiid et al., 2020) to the nearby cities of *Jabodetabek,* Indonesia's largest megacity (Rustiadi et al., 2015). The PIKJ is located in Jakarta as the central city and supports the market in surrounding areas, namely Bogor, Depok, Tangerang and Bekasi. These cities are located in other provinces, but have a close business relationship with Jakarta (Rustiadi et al., 2015). Because of this, the customers' dispersion value is high, but still locally situated (local-dispersed structure).

Not only support the *Jabodetabek* area, PIKJ also distribute the products to other islands like Southern Sumatra (within 500 km). For example, a shallot vendor sells the product to some cities on Sumatra Island, namely Lampung and Bangka Belitung. The shallot can optimally grow in Java and Nusa Tenggara, and is limited in Sumatrac, thus PIKJ in Jakarta is a gathering or transit point or distributor storage (Chopra, 2019) for shallots from Java Island to be transported to Sumatra Island. This mechanism is commonly done to lower the transportation cost because the shallot can be transported in an aggregate amount.

Garlic and orange have widely dispersed suppliers because their suppliers are importers in big cities. The vendors cannot import by themselves because of the limited quota for imports and difficult regulations through various ministries (Ministry of Trade, Agriculture, etc.), which allows only big importers to get products from their origins. BP01 mentioned that it is difficult for them to get the import permit due to burdensome requirements (*BP01-01*). The importers also have bigger resources, such as capital and storage facilities, making them able to delay or speed up the selling of garlic (control the "faucet") to support their interests *(BP01-20)*. In this research, we found that there are no vendors in PIKJ who import products by themselves.

All vendors in TWFM have a network governance system

On the other hand, the measurement of channel governance variables shows that TWFM in Indonesia has a **'network' governance model**. TWFM has low vertical integration due to a lack of farmland ownership and minimal processing, but maintains medium to strong supply chain links (Stock et al., 2000). Network is the intermediate form of governance between the completely competitive market and the vertically integrated hierarchy (Powell, 1990). A strong relationship between its members is the most significant characteristic of this governance (Niehaves and Palttfaut, 2011). Having this characteristic differentiates wholesale markets from retail markets that have market governance where the regulation is based on prices and the commitment among partners is low (Niehaves and Palttfaut, 2011). Moreover, the network system also allows flexibility

and changes, which are not commonly found in hierarchical systems (Niehaves and Palttfaut, 2011).

The operations strategy applied by TWFM Vendors is not determined by its SC structure

Contrary to the theoretical expectations outlined in Table 6, the findings indicate that vendors **do not** select their operational strategies **based on the SC structure**. In practice, garlic vendors predominantly adopt a quality-driven strategy, despite this approach being theoretically misaligned with their network governance. Similarly, vendors in the orange and cabbage supply chains exhibit a mismatch in both key dimensions of supply chain structure and operational strategy. Notably, shallot stands out as the only commodity where the applied strategy—flexibility—aligns with the theoretically prescribed best-fit configuration.

We analysed the vendors' reasons for choosing a strategy and found **logical relations between operations strategy with the performance,** i.e., quality, efficiency/profit, flexibility/good relationship between SC actors and responsiveness. There are some relations found between the reasoning of each strategy, as depicted in Figure 9.

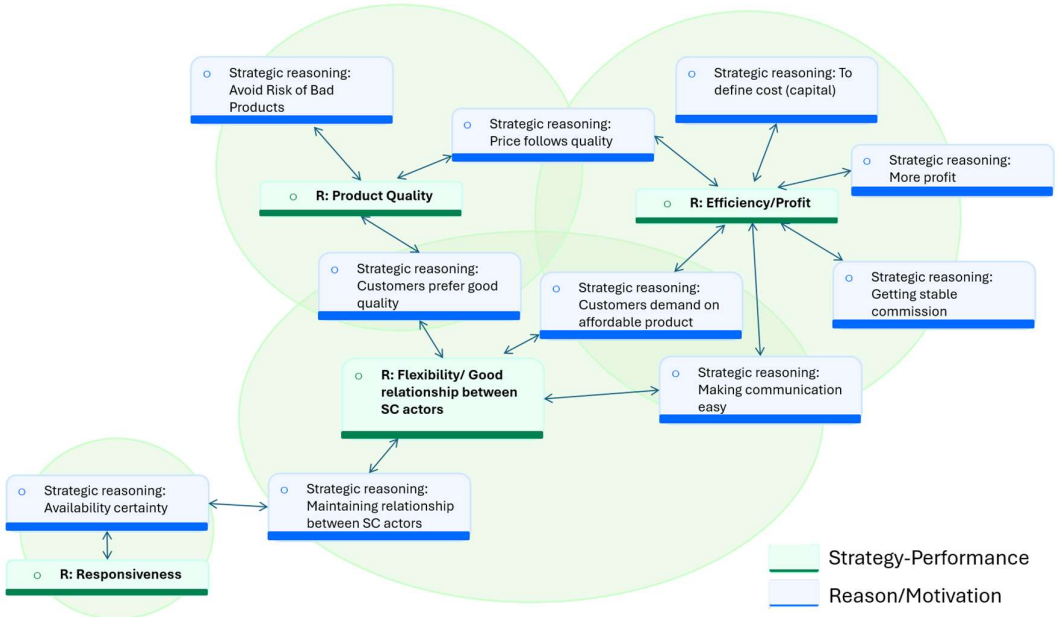

Figure 10 Relationship between Operations Strategy and Performance

We found out that **efficiency/profit** is the most underlying factor in decision making, which is shown by the strong relation to other factors. The adoption of the **cost-efficiency strategy** is driven by the goal of maximising profitability (*BM03-28; JR03-28*), minimising input cost (*BP01-28*), and meeting consumer demand for affordable prices (*JR02-28*). Furthermore, the vendors seek to secure stable commissions in volatile markets by having good/flexible communication with suppliers and customers (*BM02-28; BM01-28,*

BM03-28). The latter motivations are related to the **flexibility strategy,** which aims to maintain the good relationship between SC actors (*JR01-28*).

Maintaining good relationships by fulfilling customers' demand for good quality products (*BP02-28; KL03-28*) and mitigating the risk of distributing bad quality products (*BP03-28*) are the driving forces of vendors who prioritise the **quality-focused strategy**. Moreover, this strategy also aims to achieve higher profit by providing good quality products (*BP02-28; KL01-28*), thus, related back to the cost-efficiency strategy.

In contrast, the **delivery strategy** operates independently of the other three. Its primary objective is to guarantee product availability, which in turn improves responsiveness. However, it is still related to the motivation to maintain a good relationship between SC members.

Additionally, we found that **customers' preferences** play an important role in shaping the SC strategy. For example, cabbage and garlic customers prefer high-quality products, making the vendor prioritise quality (*KL03-28; BP02-28*), while orange customers tend to look for a more affordable product, so the vendors must follow this demand by providing affordable products (*JR02-28; JR03-28*).

The Influence of Product Characteristics

Shallots and cabbages share a common characteristic in terms of product origin: both are locally produced or cultivated within the country. This local sourcing contributes to a geographically dispersed supply chain structure for both commodities. In contrast, garlic and oranges are primarily imported, resulting in a more centralised or focused supply chain dispersion. These patterns posit that **product characteristics**—particularly origin—**influence the SC structure**.

On the other hand, there are differences in the strategy applied by the commodities with a similar SC structure. Shallot vendors prioritise flexibility, but cabbage quality. Interestingly, this difference is also due to the different characteristics regarding product form. Cabbages come in bulk and need to be constantly peeled to maintain their freshness, which makes good quality preferable (*KL01-25; KL02-25*). Different from shallots that are sold directly in the package form, the vendors do not even open the package. Moreover, the difference in the strategy of garlic and orange is due to the difference in product availability. Besides its dependency on external control, garlic is available and is needed all year long, which allows the vendors can focus on improving quality. Meanwhile, orange is seasonal and competes with other seasonal fruits, thus making the vendor prioritise cost over quality. It is expected to have maximum profit before the season of a product ends. These examples indicate that the **product characteristics influence the operations strategy**.

6. Conclusion

TWFM are identified as having **network channel governance** with low vertical integration and strong relationships between SC actors. The TWFM in urban areas sources their fresh produce from various origins based on the product characteristics. The geographic distance and dispersion relate to the characteristics of each product: the focused one needs to be grown in specific agri-climate conditions, has a shorter shelf life, and has more limited storage facilities, and vice versa. The importation of fresh products cannot be done directly by the TWFM, thus, the wholesale vendor needs to buy them from importers, which are usually located inside or near the big cities, resulting in more dispersed geographic dispersion.

The SC structures ***do not*** determine the operations strategy applied by the vendors in TWFM. We found that the operations strategy is motivated by the performance that vendors tend to achieve, which are: profit/efficiency, flexibility/good relationship, quality and responsiveness. From all the motivations, **efficiency/profit** is the most underlying factor in decision-making, even though **quality** is the most preferred strategy mentioned by the vendors.

Product characteristics play an important role in shaping the SC structure and the operations strategy of vendors in TWMF, together with the consumer preference and motivation to build a strong connection between SC members.

6.1. Limitations and Further Research

Several limitations were found in this research. Firstly, this study failed to include the effect of the alignment between SC structure and strategy on the performance. Aligning with the research by Romero-Silva et al. (2018), a system approach is suggested to be used in future research. Secondly, this study focuses on TWFM in Indonesia, which may limit the generalizability of findings to other countries with different market structures, regulatory environments, and economic conditions. Future research could conduct comparative studies across multiple regions. Thirdly, regarding the product limitations. The research examines specific fresh produce (shallots, garlic, cabbage, oranges), which may not fully capture the supply chain dynamics of other perishable goods like seafood or dairy products. Expanding the scope to include a broader range of products could enhance the findings.

Moreover, there are constraints in the data collection. Interviews and observations were conducted within a limited sample of vendors, which may not fully represent the diversity of market participants. A larger sample or longitudinal study could provide deeper insights. Additionally, the research does not extensively explore the impact of macroeconomic trends, government interventions, climate change, or global trade

policies on TWFM. Future studies could integrate these factors to offer a more comprehensive analysis.

This research highlights efficiency and profit, shaped by product characteristics, as key drivers in decision-making within TWFM. Therefore, this research raises new questions about how TWFM can provide practical benefits. For instance, it can lead to policy discussions aimed at improving market performance and reducing food waste. It also creates space for interdisciplinary and sustainability exploration, including the role of management practices and technological solutions in contributing to more resilient and environmentally responsible traditional market systems. In addition, the research approach can be adapted and applied to other cities or countries facing similar challenges with logistics and market systems.

References

Akkerman, R., Farahani, P., & Grunow, M. (2010). Quality, safety, and sustainability in food distribution: a review of quantitative operations management approaches and challenges. *OR spectrum, 32, 863-904*.

Amentae, T. K., Gebresenbet, G., & Ljungberg, D. (2018). Examining the interface between supply chain governance structure choice and supply chain performances of dairy chains in Ethiopia. *International Food and Agribusiness Management Review*, *21*(8), 1061-1082.

Aramyan, L. H., Ondersteijn, C. J., Van Kooten, O., & Lansink, A. O. (2006). Performance indicators in agri-food production chains. *In Quantifying the agri-food supply chain* (No. 15, pp. 47-64). Springer/Kluwer.

Ariadi, G., Surachman, Sumiati, & Rohman, F. (2021). The effect of lean and agile supply chain strategy on financial performance with mediating of strategic supplier integration & strategic customer integration: Evidence from bottled drinking-water industry in Indonesia. *Cogent Business & Management*, 8(1), 1930500.

Bask, A., & Tinnilä, M. (2013). Impact of product characteristics on supply chains: an analytical literature review. *International Journal of Applied Logistics (IJAL)*, *4*(1), 35-59.

Bonatto, F., de Resende, L. M. M., & Pontes, J. (2020). Relational governance in supply chain: a systematic literature review. *Benchmarking: An International Journal*, 27(6), 1711-1741.

Boselie, D., Henson, S., & Weatherspoon, D. (2003). Supermarket procurement practices in developing countries: Redefining the roles of the public and private sectors. *American journal of agricultural economics*, 85(5), 1155-1161.

Brinkmann, S. (2014). 14 Unstructured and Semi-Structured Interviewing. *The Oxford handbook of qualitative research*, 277.

Cadilhon, J. J., Fearne, A. P., Moustier, P., & Poole, N. D. (2003). Modelling vegetable marketing systems in South East Asia: phenomenological insights from Vietnam. *Supply Chain Management: an international journal*, 8(5), 427-441.

Cadilhon, J. J., Moustier, P., Poole, N. D., Tam, P. T. G., & Fearne, A. P. (2006). Traditional vs. modern food systems? Insights from vegetable supply chains to Ho Chi Minh City (Vietnam). *Development Policy Review*, 24(1), 31-49.

Cai, X., Chen, J., Xiao, Y., Xu, X., & Yu, G. (2013). Fresh-product supply chain management with logistics outsourcing. *Omega*, 41(4), 752-765.

Christopher, M., Lowson, R., & Peck, H. (2004). Creating agile supply chains in the fashion industry. *International Journal of Retail & Distribution Management*, *32*(8), 367-376.

Douiri, M. R. (2019). Particle swarm optimized neuro-fuzzy system for photovoltaic power forecasting model. *Solar Energy*, *184*, 91-104.

Eriyatno, E., Larasati, L., Herianto, A., Fatmaningrum, D., Bucatariu, C., & Galvez-Nogales, E. (2024). *Food loss prevention and reduction analysis in Indonesia: A case study on chili, cabbage and shallot*. Food & Agriculture Org.

Ferdian, Y., Suwitri, S., Warsono, H., & Purnaweni, H. (2020). Revitalization of Traditional Market in Semarang City. *European journal of economics and management sciences*, (4), 62-74.

Goldman, A., Krider, R., & Ramaswami, S. (1999). The persistent competitive advantage of traditional food retailers in Asia: wet markets' continued dominance in Hong Kong. *Journal of macromarketing*, 19(2), 126-139.

Haleem, F., Jehangir, M., & Baig, A. (2017). Operations strategy practices of SMES. Global Economics Review, II.

Hamdaoui, M., & Bouayad, B. (2019). Determinants and effects of vertical integration on the performance of Moroccan manufacturing. Athens Journal of Mediterranean Studies, 5(1), 57-78.

Heidarzadeh, S., Doniavi, A., & Solimanpur, M. (2017). Development of supply chain strategy in Iranian automotive industry based on system dynamics and game theory. Scientia Iranica, 24(6), 3345-3354.

Hu, D., Reardon, T., Rozelle, S., Timmer, P., & Wang, H. (2004). The emergence of supermarkets with Chinese characteristics: challenges and opportunities for China's agricultural development. *Development policy review*, 22(5), 557-586.

Indonesian Central Bureau of Statistics. (2024). Statistik Indonesia 2024. ISSN/ISBN : 0126-2912

Informatic and Statistic of East Jakarta Municipality, (2022)

Kalchschmidt, M., Birolini, S., Cattaneo, M., Malighetti, P., & Paleari, S. (2020). The geography of suppliers and retailers. *Journal of Purchasing and Supply Management*, *26*(4), 100626.

Kurniasari, F., Lestari, E. D., & Tannady, H. (2023). Pursuing long-term business performance: Investigating the effects of financial and technological factors on digital adoption to leverage SME performance and business sustainability—Evidence from Indonesian SMEs in the traditional market. *Sustainability*, *15*(16), 12668.

Lacey, A., & Luff, D. (2001). *Qualitative data analysis* (pp. 320-357). UK: Trent Focus Group.

Lemeilleur, S. (2014). The role of input vouchers in modernizing the fresh fruit and vegetable market in Turkey. *Agricultural Economics*, 45(4), 477-487.

Li, L., Li, D., & Shi, W. (2011). Internationalization, internalization and the performance of US biopharmaceutical SMEs. *Multinational Business Review*, *19*(1), 65-93.

Lorentz, H., Töyli, J., Solakivi, T., Hälinen, H. M., & Ojala, L. (2012). Effects of geographic dispersion on intra-firm supply chain performance. *Supply Chain Management: An International Journal*, *17*(6), 611-626.

Luo, X., Wang, Z., Lu, L., & Guan, Y. (2020). Supply Chain Flexibility Evaluation Based on Matter-Element Extension. *Complexity*, *2020*(1), 8057924.

Luning, P. A., & Marcelis, W. J. (2006). A techno-managerial approach in food quality management research. *Trends in Food Science & Technology*, *17*(7), 378-385.

Majiid, R. I. S., Sutrisno, J., & Barokah, U. (2020). Measuring the satisfaction levels of customers of fresh vegetables towards the marketing mix in traditional markets in Sukoharjo regency, Indonesia.

Maryam, N., Nurasa, H., Alexandri, M., & Sugandi, Y. (2021). Designing a food supply chain network under public-private community partnership on traditional Indonesia markets. Uncertain Supply Chain Management, 9(4), 841-850.

Midmore, D. J., & Jansen, H. G. (2003). Supplying vegetables to Asian cities: is there a case for peri-urban production?. *Food Policy*, 28(1), 13-27.

Mila, F. A., Nahar, A., Amin, M. R., Culas, R. J., & Ahmed, A. (2022). Empirical assessment of onion supply chain constraints in Bangladesh: A pre-covid to covid situation. *Journal of Agriculture and Food Research*, 10, 100418.

Nakandala, D., & Lau, H. C. W. (2019). Innovative adoption of hybrid supply chain strategies in urban local fresh food supply chain. *Supply Chain Management: An International Journal*, *24*(2), 241-255.

Napitupulu, T. A. (2010). Marketing System of Fresh Friut and Vegetable: The Role of Modern and Wholesale Market in Jakarta and the Vicinity. *Binus Business Review*, 1(1), 155-168.

Niehaves, B., & Plattfaut, R. (2011, August). Market, network, hierarchy: emerging mechanisms of governance in business process management. In *International Conference on Electronic Government* (pp. 185-197). Berlin, Heidelberg: Springer Berlin Heidelberg.

Nugroho, T. S., Balijepalli, C., & Whiteing, A. (2021). Independent Retailer Restocking Choices in Urban Goods Movement and Interaction Effects with Traditional Markets. *Networks and Spatial Economics*, 21(4), 933-969.

Patel, P. C., Azadegan, A., & Ellram, L. M. (2013). The effects of strategic and structural supply chain orientation on operational and customer-focused performance. *Decision Sciences*, *44*(4), 713-753.

Rustiadi, E., Pribadi, D. O., Pravitasari, A. E., Indraprahasta, G. S., & Iman, L. S. (2015). Jabodetabek megacity: From city development toward urban complex management system. *Urban development challenges, risks and resilience in Asian mega cities*, 421-445.

Qi, Y., Huo, B., Wang, Z., & Yeung, H. Y. J. (2017). The impact of operations and supply chain strategies on integration and performance. International Journal of Production Economics, 185, 162-174.

Reardon, T., Timmer, C. P., Barrett, C. B., & Berdegué, J. (2003). The rise of supermarkets in Africa, Asia, and Latin America. *American journal of agricultural economics,* 85(5), 1140-1146.

Romero-Silva, R., Santos, J., & Hurtado, M. (2018). A note on defining organisational systems for contingency theory in OM. *Production Planning & Control*, *29*(16), 1343-1348.

Saptana, S., Perwita, A. D., & Sukmaya, S. G. (2021). Analysis of garlic commodity competitiveness and impact of government policy in Indonesia. In *E3S Web of Conferences* (Vol. 316, p. 02016). EDP Sciences.

Sari, D. K., Koestiono, D., & Shinta, A. (2021). Analysis Influence Relationship of Internal and External on Strategy and Sustainable Supply Chains Management on Operational Performance of Food and Beverages Agro-Industries. *Agricultural Socio-Economics Journal*, *21*(3), 241-250.

Sharma, D., Alam, M. J., Begum, I. A., Ding, S., & McKenzie, A. M. (2023). A Value Chain Analysis of Cauliflower and Tomato in Bangladesh. *Sustainability*, 15(14), 11395.

Shepherd, A. W. (2005, July). Financing of horticultural marketing in Asia. *In I International Symposium on Improving the Performance of Supply Chains in the Transitional Economies* 699 (pp. 391-398).

Skinner, G. W. (1978). Vegetable supply and marketing in Chinese cities. *The China Quarterly*, 76, 733-793.

Slack, N. (2005). Operations strategy: will it ever realize its potential?. *Gestão & Produção*, *12*, 323-332.

Sousa, R., & Voss, C. A. (2008). Contingency research in operations management practices. *Journal of Operations management*, *26*(6), 697-713.

Stock, G. N., Greis, N. P., & Kasarda, J. D. (2000). Enterprise logistics and supply chain structure: the role of fit. *Journal of operations management*, 18(5), 531-547.

Sulihanti, S., Kuntarshi, S., & Husni, I. (2005, July). Assessment of Banana Supply to Cengkareng Wholesale Market, Banten, Indonesia. *In I International Symposium on Improving the Performance of Supply Chains in the Transitional Economies* 699 (pp. 253-262).

Tama, I. P., Akbar, Z., & Eunike, A. (2018, April). Implementation of system dynamic simulation method to optimize profit in supply chain network of vegetable product. *In IOP Conference Series: Materials Science and Engineering* (Vol. 337, No. 1, p. 012014). IOP Publishing.

Tenhiälä, A. (2011). Contingency theory of capacity planning: The link between process types and planning methods. *Journal of Operations Management*, *29*(1-2), 65-77.

Vickery, S. N., Calantone, R., & Dröge, C. (1999). Supply chain flexibility: an empirical study. *Journal of supply chain management*, *35*(2), 16-24.

Wang, H., Dong, X., Rozelle, S., Huang, J., & Reardon, T. (2009). Producing and procuring horticultural crops with Chinese characteristics: the case of Northern China. *World Development*, 37(11), 1791-1801.

Wang, X., & Li, D. (2012). A dynamic product quality evaluation based pricing model for perishable food supply chains. *Omega*, 40(6), 906-917.

Yeshiwas, Y., Alemayehu, M., & Adgo, E. (2024). Strategic mapping of onion supply chains: a comprehensive analysis of production and post-harvest processes in Northwest Ethiopia. *Frontiers in Sustainability*, 5, 1387907.

Zhang, Q. F., & Pan, Z. (2013). The transformation of urban vegetable retail in China: Wet markets, supermarkets and informal markets in Shanghai. *Journal of Contemporary Asia*, 43(3), 497-518.