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Supply Chain Implementation Strategy InThe SPPG Kitchen Network Area AsA Solution To SPPG Problems In Indonesia

Nabaraj Bhowmik[1]; Dr. Dipangshu Dev Chowdhury [2]; Dr. Andri Hermawan [3]

[1.] Ph.D Research Fellow,MBA(Marketing), ICFAI University Tripura,
e-mail - nabarajbhowmik@gmail.comORCID- https://orcid.org/0009-0009-7017-0922
[2]. Assistant Professor, ICFAI University Tripura, e-mail - dipangshuchowdhury@gmail.com
ORCID- https://orcid.org/0000-0003-2262-3228
[3] Dr.Andri Hermawan, A.MI., MT, University of Muhammadiyah Cirebon. Faculty of Engineering
Industrial Engineering Study Program
Corresponding Author. E-mail: andri.hermawan@umc.ac.id

Abstract

Background. The SPPG Kitchen Program has been running for more than a year as an effort to meet the food needs of the beneficiary communities. Although it has shown various progress, its implementation still faces a number of obstacles that have an impact on service quality, including the suspension of around 1500 SPPG units.

Aims. This research aims to analyze problems in the implementation of SPPG and formulate effective supply chain implementation strategies.

Methods. The methodology used includes stakeholder mapping, food safety, and K3 knowledge gap analysis, and cause-and-effect analysis. In addition, the SCOR (Supply Chain Operations Reference) model approach and SWOT analysis are used to deepen the evaluation of supply chain systems.

Result. The results of the study show that the main problems lie in the disintegration of the supply chain, differences in stakeholder interests, and low human resource capacity. Recommended strategies include system integration, process simplification, human resource capacity building, and strengthening local ecosystems.

Implementation. The implementation of this strategy is expected to improve the efficiency, stability, and quality of SPPG services.

Keywords: Supply Chain, SPPG, SCOR Model, SWOT, Food Supply Chain, Operational Management

INTRODUCTION

The SPPG Kitchen program has been implemented for approximately one year, with the main goal of improving the quality of food provided to the beneficiary community. During this period, various advances have been achieved, including expanding food distribution, forming kitchen networks across regions, and increasing participation by various stakeholders.However, various failures and obstacles arise during implementation, including non-compliance with operational standards, weak coordination between parties, and supply chain instability.

As part of enforcing quality standards, suspension action has been taken against around 1500 SPPG units considered not to have met the criteria. This indicates that there are organizational issues that need a strategic-based supply chain solution.

Problem Formulation

The issues which caused the suspension of SPPG are complicated and numerous. Some of the key issues identified are as follows:

Differences of Interest Between Stakeholders

There are differences in interests between the various parties involved, including BGN, BGN Partners as investors, SPPG Executors, SPPG Suppliers, SPPG Volunteers, Schools and Teachers as beneficiaries, and parents of students. These differences often lead to conflicts in decision-making and operational implementation.

Limited Knowledge and Competence

Limited understanding of the implementation of SPPG standards remains at various levels, including BGN Partners, operational employees, volunteers, teachers, parents, and suppliers. This has an impact on the low quality of implementation and the inconsistency in the implementation of standards.

Supply Chain Ecosystem Fragility

The supply chain ecosystem that has been formed is still vulnerable to disruptions, especially at the local level. This condition causes instability in food supply and an increase in the price of staples, which has a direct impact on SPPG operations. And it will also cause an increase in the price of staples to the community around the SPPG area.

Supply Chain Process Complexity

The lack of simplification in the supply chain process leads to high operational costs. This makes it difficult for the SPPG to meet the set quality standards. For example, to process a predetermined yet varied menu, additional preparation activities must be carried out at SPPG. For this reason, the preparation workload requires sufficient time and effort to produce at least 2000 portions at once, while the time required is limited to approximately 4 hours for the Beneficiary to eat the food from the SPPG. If the food is not kept at a temperature between 5 degrees Celsius and 60 degrees Celsius for the holding time, E. coli bacteria or other viruses can contaminate it, causing food poisoning.

METHODS

This study uses a qualitative, descriptive approach to understand, in depth, the dynamics of SPPG implementation from the supply chain perspective. The qualitative approach was chosen because it can explore the complexity of stakeholder interactions and identify the contextual, multidimensional root of the problem (Creswell, 2014). This analysis is performed using some of the complementary conceptual frameworks in the following way:

Stakeholder Mapping

Stakeholder mapping determines and categorizes the major actors in the SPPG system based on their level of interest and strength. The strategy is necessary to comprehend the possible conflict, lack of coordination and collaboration opportunities of parties (Freeman, 1984). When considering supply chains, there are a number of actors, including governments, partners, suppliers, and beneficiaries, whereby, the alignment of interests must occur to form an effective stream of values (Christopher, 2016).

Knowledge Gap Analysis

This analysis aims to identify the differences between the competencies possessed and those needed, especially in food safety, occupational safety, and health (K3). One of the primary determinants of the quality of operations and adherence to standards is knowledge gaps (Heizer et al., 2017). Through the recognition of these gaps, specific interventions, including training and standardization, can be put in place in a more efficient way.

Fishbone Analysis

Fishbone diagrams or Ishikawa diagrams are diagrams that are used to identify the root causes of problems systematically by categorizing factors into human, methods, materials, machines, environment, and management (Ishikawa, 1985). This technique is useful in the analysis of complex operational issues and assists in developing solutions to the problems based on the cause of the problem rather than the symptom (Slack et al., 2010).

SCOR Model Approach

The SCOR (Supply Chain Operations Reference) model is used as a framework to evaluate supply chain performance as a whole based on five main processes: Plan, Source, Make, Deliver, and Return (Supply Chain Council, 2012). The model makes it possible to identify potential bottlenecks within the supply chain and develops a foundation on which improvement can be made every day. SCOR has also been widely used in various industries to improve supply chain efficiency, responsiveness, and resilience (Chopra & Meindl, 2019).

SWOT analysis

The SWOT analysis can be utilized to assess the internal factors (strengths and weaknesses) and external factors (opportunities and threats) that influence the application of SPPG. This method can be used to develop adaptive strategies that are based on actual organizational realities (Helms and Nixon, 2010). SWOT, in the context of supply chain, is a significant tool towards aligning internal capabilities with the dynamics of the changing external environment that is fast changing.

DISCUSSION

Results of Stakeholder Mapping

The stakeholder mapping is carried out to determine the strategic position of each of the actors in the ecosystem of SPPG in two dimensions, namely, the degree of interest and the degree of influence (power). This method gives in-depth view of how relationships among stakeholders work out, possible conflicts, coordination requirements and chances of collaboration that can be maximized (Freeman, 1984). Within the framework of supply chain, alignment among actors becomes a crucial aspect of establishing an effective flow of goods, information and value

(Christopher, 2016). The results of the mapping indicate that the SPPG ecosystem has a number of key stakeholder groups, i.e.:

1. Government (BGN) – has a high level of influence and high importance because it plays a role as a regulator, supervisor, and policy maker.
2. BGN Partners (Investors/Operators) – have high influence and high stakes as they are directly involved in funding and operations.
3. SPPG Executors (Kitchen Managers) – have high importance but relatively medium influence, as they are responsible for daily implementation.
4. Food Suppliers – have medium to strong influence depending on the scale of distribution, as well as economic importance to the sustainability of the program.
5. SPPG Volunteers – have high importance but low influence, especially in the operational aspects of the field.
6. Schools and Teachers – have a high interest as indirect beneficiaries, with intermediate influence in supervision.
7. Beneficiaries (Students) – have very high importance but low influence.
8. Pupil Parents – has high importance and intermediate influence in the form of social pressure and public perception.

Stakeholder Map (Power vs Interest Matrix)

HIGH POWER

|
| Government (BGN)
| BGN Partners
|
|

LOW INTEREST

HIGH INTEREST

|
| Supplier
| School/Teacher
|
| SPPG Executor
| Parents
| Volunteers

| Beneficiaries

LOW POWER

These results demonstrate that the asymmetry of power and interest is a significant factor that contributes to dysfunction in the SPPG supply chain. Therefore, a coordination strategy that engages stakeholders is needed to improve the effectiveness of program implementation.

Knowledge Gap Analysis

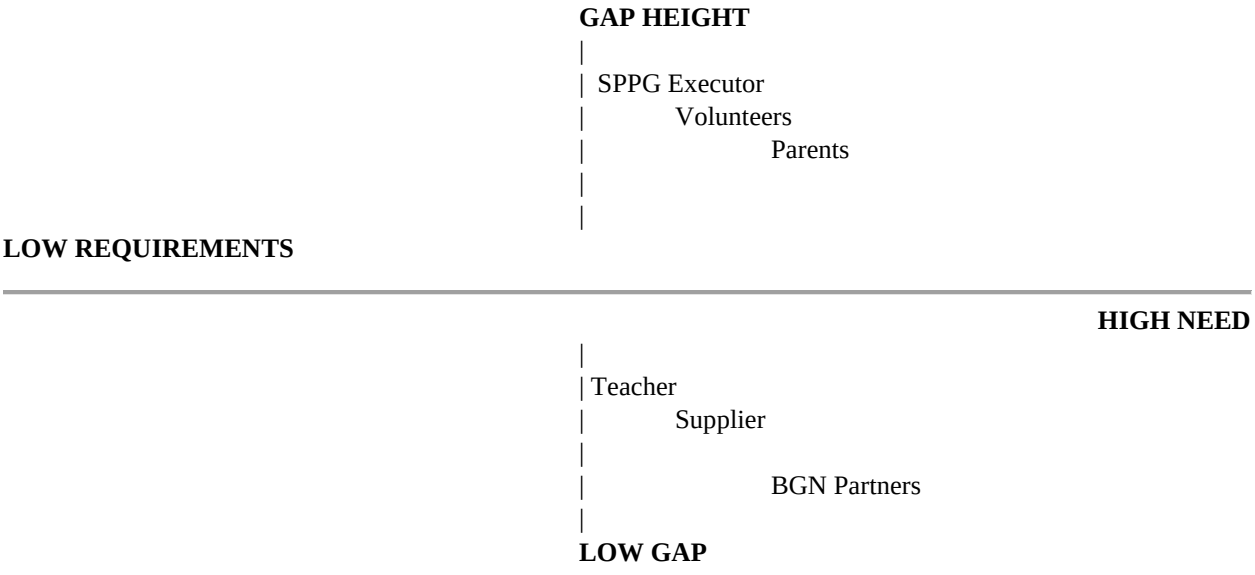
The analysis of the knowledge gaps is implemented in order to determine the difference between the competencies that SPPG implementers actually have and the competencies that they should have, especially, food safety, occupational safety, and health (K3). This is a gap that is a critical factor in terms of the quality of operations, standard implementation consistency, and adherence to regulations (Heizer et al., 2017).

The analysis was performed in the context of SPPG and it was split into several main groups of implementers, i.e. BGN Partners, SPPG Implementers, Volunteers, Suppliers, Teachers and Parents. The analysis results indicate that the majority of actors are poorly familiar with the food safety standards, food hygiene practices, and the fundamental principles of K3. This situation causes considerable differences in the quality of services in SPPG units.

Knowledge Gap Mapping Results

Stakeholder	Competencies Required	Current Competencies	Gap Rate
BGN Partners	Supply chain management, quality standards	Intermediate	Medium
SPPG Executor	Kitchen SOPs, food safety, K3	Low	Height
Volunteers	Hygiene, basic procedures	Low	Height
Supplier	Material quality standards	Intermediate	Medium
Teacher	Healthy consumption education	Low	Medium
Parents	Nutrition awareness and food safety	Low	Height

Knowledge Gap Map



Interpretation

1. High Need -High Gap: High competency needs but low level of understanding means that SPPG Executors and Volunteers are the top priority in the training program.

2. High Need -Middle Gap: Suppliers and Teachers require capacity building in terms of technical training and education.

3. Medium Gap - High Influence: BGN partners should pay attention to the expansion of managerial capacity and integration of systems.

These results indicate that knowledge gaps are one of the factors that lead to variations in SPPG standards implementation. Thus, to achieve quality improvement continuously, intervention strategies including structured training, modules of national standards, and competency-based monitoring systems are required.

Fishbone Analysis

Fishbone diagrams or Ishikawa diagrams are a system of identifying root causes of problems in a systematic manner by categorizing factors into groups like humans, methods, materials, machines, environment and management (Ishikawa, 1985). This is a good approach to

problem analysis of more complicated operational issues and aids in developing solutions that rely on the underlying cause, rather than the symptoms (Slack et al., 2010).

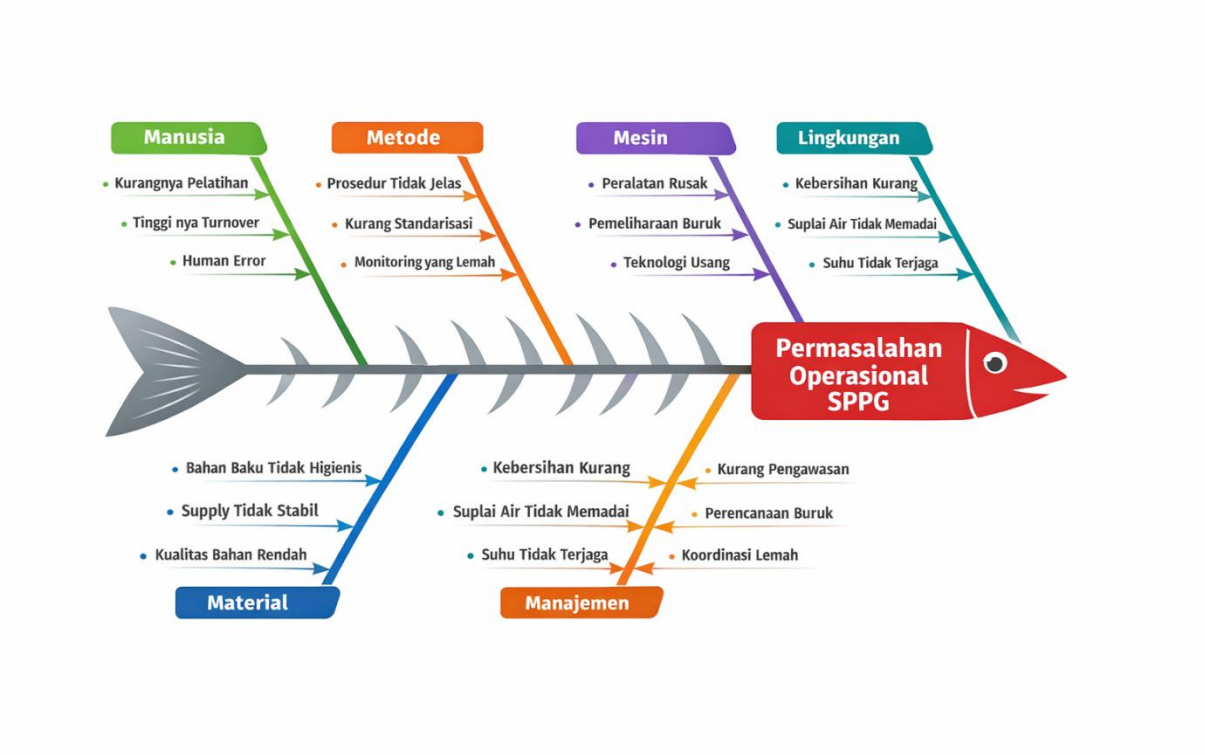


Figure 1. Fishbound Diagram of SPPG Operational Problems

Fishbone Diagram Explained

The Figure above is based on the concept of the Fishbone (Ishikawa) diagram that is used to systematically demonstrate the primary root cause of the operational issues of SPPG: the gap between standards and service quality. According to the cause-and-effect analysis method that was invented by Ishikawa (1985), this diagram clusters causal factors into six major groups (6M), i.e. Man, Method, Material, Machine, Environment and Management. The problems of the lack of training, low awareness of the aspects of occupational safety and health (K3), and high turnover of the volunteers are the major issues in the Man category. The result of this condition is the incongruence of kitchen operations and the risk of human error. Under the Method aspect, it was discovered that the standard operating procedures (SOPs) in use are still complex, less standardized, and are not socialized. This has the effect of creating a discrepancy in formulation and application in the field and decreases adherence to the stipulated standards. Material Factors

indicate inconsistencies on quality of raw materials, unreliable supply and risk of using materials that are not hygienically acceptable. The quality of the final product that the beneficiaries receive is directly impacted by this problem. In the Machine category, the limitation of kitchen facilities and equipment is the main obstacle. Most SPPG departments have nonstandard, poorly maintained or outdated equipment which prevents effective, hygienic production process. Environmental aspect indicates external influence like geographical factors, inaccessibility of distribution, and variation in the prices of the basic materials. Such differences in conditions are a challenge to operational consistency across regions.In the meantime, the management factor is the source of the systemic issue, which can be described as a poor coordination among the stakeholders, absence of an integrated monitoring and evaluation system, and variations in the interests of the parties participating in the SPPG ecosystem. All in all, this diagram demonstrates that the operational issues of SPPG are not influenced by one particular factor but are the result of a complex interdependence of factors. Thus, the solutions developed should be holistic and systemic, which involves adding human resource capacity, streamlining the operational processes, enhancing management systems, and stabilizing the supply chain.

SCOR Model Approach Analysis

The SCOR (Supply Chain Operations Reference) model is an analytic framework that is implemented to determine the overall performance of the supply chain in five key processes:Plan, Source, Make, Deliver, and Return (Supply Chain Council, 2012). This method offers a systematic framework of detecting the weaknesses, gauging the performance, and developing sustainable improvement plans. Moreover, the SCOR model has been effective in the different industries because of its capability to enhance the operational efficiency, flexibility, and supply chain resilience to disruptions (Chopra and Meindl, 2019).

According to the analysis findings, a few important findings were made in each SCOR process as follows:

1. Plan. There is a breakdown of stakeholders within the supply chain in the planning process. This is evident in the absence of synchronization in demand planning, procurement of raw materials and production capacity. Consequently, a discrepancy between the real needs and the availability of resources is common. Such a state implies the necessity of a comprehensive

system of data-driven planning which will be able to combine information in real time to enhance the accuracy of the forecast and cross-functional coordination.

2. Source (Procurement). As part of the procurement, it was identified that the company is highly dependent on some suppliers. This reliance is very dangerous particularly in cases where it is faced with supply delays or price increment or operational disturbances on the part of the supplier. Weak supplier diversification suggests this is not ideal in terms of risk mitigation strategies. This means that there is need to create other supplier networks as well as to review the performance of suppliers periodically in order to enhance supply reliability.
3. Make (Production). The quality of the product is inconsistent in the production process due to differences in the standards of operations in the kitchen. The variation in work processes, methods of processing and quality control will lead to inconsistent final outputs. This can have an impact on customer satisfaction and brand image. The standardization of production processes and the adoption of a rigorous quality control are significant measures to maintain the same quality of products in all operational units.
4. Deliver The.The distribution channel also continues to experience efficiency problems particularly in the remote locations. Poor infrastructure, inefficient distribution channels and lack of an integrated logistics management system contribute to delays in delivering products and high distribution costs. There is a need to optimize the distribution networks, employ logistics technology, and enhance path planning to enhance speed and accuracy of delivery.
5. Return (Return and Evaluation). The return-and-evaluation mechanism unveils the frailties in managing feedback. The data collection-data analysis system on customer complaints, defective products or returns have not been functioning optimally. This impedes the process of learning and continuous improvement in the organization. There is a need to have a systematic evaluation framework with the utilization of customer data and performance metrics to enable more responsive decision making.

In general, the findings of the analysis with the use of the SCOR approach demonstrate that, despite the functioning of the supply chain, there are a number of loopholes that have to be improved, in particular, in terms of system integration, risk management, standardization of processes, distribution efficiency, and feedback management. The SCOR-based improvements implemented are believed to improve the overall and sustainability of the supply chain.

SWOT Analysis Results

SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is used to identify internal and external factors affecting the system under study's performance. This strategy assists in coming up with the appropriate strategy by exploiting strengths and opportunities and reducing weaknesses and threats.

The above condition mapping was obtained based on the outcomes of the analysis:

1. Strengths. The support of national programs which give legitimacy, policy direction and sustainable funding potential is one of the main strengths. This assistance is a crucial base in the long-term viability of operations and development of the system.Moreover, the availability of extensive network of the kitchen is a strategic benefit in facilitating distribution and service. This network facilitates increased coverage, enhanced access to services and faster delivery of needs. Having the network in place, the organization can have enough capital to acquire and grow in capacity of service.
2. Weaknesses. Lack of system integration across the supply chain is the primary weakness of the company on the internal side. The lack of connections between data and processes between the units results in inefficiency, delays in decision-making, and possible mistakes in the work. This indicates the necessity of an integrated information system that is technology-based.Secondly, there is a shortage of trained human resources (HR) that can be a barrier to the adoption of best operations. Absence of technical ability and knowledge of the operational norms contributes to performance differences in the industry. Thus, training and development is an urgent requirement in terms of increasing the human resource capacity.
3. Opportunities. Externally, digital technology in the supply chain creates some important possibilities to enhance efficiency and transparency. Planning and operational control can be more accurate with the deployment of digital systems, including real-time tracking, data-based inventory management, and integration of platforms.Moreover, it is also a strategic opportunity to strengthen the local economy. Engaging local business players in the supply chain is not only enhancing supply of raw materials but also has a positive influence to the local economy. This may establish a win-win situation between the company and the neighborhood.
4. Threats. The primary risk is volatility in the prices of the basic commodities and this may impact on the stability of operating costs. Uncertainty of prices may interfere with budgetary

planning and minimize financial efficiency.Also, the instability of supplies locally is a major threat particularly when production, distribution or external forces like weather and economic conditions are inconvenienced. The effect of such risks on the whole supply chain can be increased in case of dependency on one source of supply without having an alternative.

In general, the outcomes of the SWOT analysis suggest a high growth potential due to good internal conditions and considerable external opportunities. Nonetheless, a proper strategy is required to address the internal vulnerabilities and to foresee numerous threats in order to keep improving the performance of the system.

SWOT Strategy Matrix

Based on the results of the identification of internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats), a strategy was formulated that combined these four elements, namely the SO, WO, ST, and WT strategies.

1. SO (Strengths–Opportunities) Strategy. This strategy aims to leverage internal strengths to optimize available opportunities.Utilize the support of national programs to encourage the implementation of digital technologies in the supply chain, such as data-based inventory management and distribution systems; optimize the extensive kitchen network as a community-based distribution center with the integration of local economic actors; Develop strategic partnerships with local MSMEs to strengthen the supply of raw materials while increasing the economic impact of the region.This strategy focuses on expansion and innovation by leveraging its existing foundations.
2. WO Strategy (Weaknesses–Opportunities). This strategy aims to mitigate weaknesses by leveraging external opportunities.Implement an integrated digital system to address the lack of coordination across supply chain units; Organize technology-based training for human resources to improve competence in modern supply chain management; Utilize local economic strengthening programs to simultaneously increase human resource capacity through collaboration with business actors and training institutions.This strategy focuses on building internal capacity through external support.
3. ST Strategy (Strengths–Threats). This strategy aims to leverage internal power to address and mitigate the impact of external threats.Using an extensive kitchen network to diversify supply sources to reduce the risk of local supply instability; Leverage the support of national programs

to stabilize prices through centralized procurement policies or long-term contracts with suppliers; Develop a data-based monitoring system to anticipate fluctuations in the price of basic commodities in a more responsive manner.This strategy is oriented towards the *supply chain's resilience* to external disturbances.

4. WT Strategy (Weaknesses–Threats). This strategy aims to minimize weaknesses while avoiding threats.Build an integrated supply chain risk management system to anticipate supply disruptions and price fluctuations; Reduce dependence on specific suppliers through supplier diversification and periodic performance evaluations; Improve operational standards and coordination between units to reduce the potential for errors due to limited human resources.This strategy is defensive and focuses on operational stability.

Supply Chain Strategy

According to the findings of the above analysis, a detailed supply chain strategy should be developed to enhance efficiency, effectiveness and overall resilience of the system. This plan is drawn up with the outcomes of SCOR and SWOT plans in mind to solve internal issues and make the most of the external opportunities.

1. Digital System Integration of the supply chain. The key plan is to establish and introduce a comprehensive digital system in the whole supply chain. This is an integration of planning, procurement, production and distribution that is integrated into one data based platform. Using digital systems, the information can be obtained in real-time and thus enhanced planning accuracy, transparency in processes, and speed of decision-making. Moreover, digitalization allows utilizing more effectively such technologies as tracking systems, demand forecasting, and inventory management.
2. Simplification of Operational SOPs.Making the standard operating procedures (SOPs) simpler is a strategic move towards minimizing complexity and variability in the operation activities. Unnecessarily elaborate and complicated SOPs may introduce inconsistencies in the implementation in the field in particular when a large number of units and locations with differing degrees of HR competence are involved. This, therefore, requires the preparation of SOPs that are simpler, clear and easy to understand without compromising the set standards of quality.The simplification of SOP should be also accompanied with the standardization of

processes to attain uniformity in the outputs of all operating networks. The quality control becomes a more simple process to execute with the standardized processes, and the risk of operational errors can be reduced.

An example is that when making a menu of fried chicken, the SOPs may concentrate on the most crucial step, which is frying. Raw material preparation, marinating, pre-cooking are the first phases that do not have to be carried out within each of these operational units and can be outsourced to suppliers of half-cooked products. In this way, the operational unit will just be required to perform the last process, frying, and serve.This method does not only make the work process simpler, it also enhances efficiency in time, consistency in taste and product quality and minimizes the use of individual skills. Moreover, more centralized and systematic quality control may be supported by using semi-finished raw materials of standard suppliers as well.

5. Ongoing Human Resources training. Another important aspect in the successful implementation of the supply chain strategies is the human resources. Thus, there is a need to have a continuous training program to enhance the competence of the human resource both technically and managerially. Such training may involve digital technology and operational management, as well as, knowledge of food quality and safety standards. Having a dynamic human resource will enable organizations to be more flexible to change and execute operations in the best possible manner.
5. Strengthening Local Suppliers. The emergence and empowerment of local suppliers are one of the major policies in enhancing supply chain resilience particularly during the uncertainty of supply and distribution forces. Involving local suppliers, organizations are able to decrease the dependency on one supplier and enhance flexibility and responsiveness to disruptions in the operations. Moreover, the method has a great economic effect by empowering the local business players and enhancing the economic ecosystem in the region.

   The process of empowering local suppliers can be implemented in the form of systematic coaching, building of long-term relationships, and adopting a sustainable system of performance evaluation. Coaching involves expansion in the production capacity, quality, and efficient operation practices. In the meantime, long-term relationships may give the suppliers an assurance of demand and organizations a supply assurance.

Moreover, this plan should be created through the creation of an alternative supply chain that is founded on semi-finished products (semi-cooked). Here, local suppliers can be not only the source of raw materials, but also producers of half-cooked products which are already processed in the form of marinating and pre-cooking. This model enables a part of the production process to be shifted upwards, such that the operational units like SPPG can specialize more on the last stage, which is the final cooking process.

The creation of the half-cooked suppliers could be done through a region-based approach or cluster-based approach i.e. by modifying the suppliers capacity to the number of the kitchens (SPPG) in a specific geographical location. The suppliers can be designed to serve multiple nearby kitchens to enable them to distribute as efficiently as possible, minimize logistics expenses, and retain the quality of products during delivery. Such cluster approach also allows more centralized and uniform quality control on regional basis.Moreover, having a number of alternative suppliers in every region is significant to curtail the danger of supply disturbances. Such a cluster based supplier diversification does not only enhance system redundancy but also results in healthy competition amongst suppliers enhancing their quality and efficiency.In general, the strategy of enhancing local suppliers along with creation of region-based half-cooked supply chains is one that not only enhances operational efficiency, but also resilience of the system, consistency in product quality and stability of the local economy.

Half-Cooked and Regional Cluster-Based Supply Chain Scheme Model

Main Groove Structure

Local Raw Material Supplier

↓

Supplier Processing (Half-Cooked Center)

↓

Regional Cluster-Based Distribution

↓

SPPG (Operational Kitchen)

↓

Consumers/Beneficiaries

Plot Explanation

Local Raw Materials Supplier. It is the principal source of raw materials such as chicken, vegetables and spices. Origins: of farmers, breeders or local business players who have passed quality standards.

Processing Supplier (Half-Cooked Center). At this stage, the process is carried out:Selection and sorting of raw materials; Marinating/seasoning; Pre-cooking (half-cooked); Standard packaging.It is an evaluation center of quality prior to the distribution of the product.

Cluster-Based Distribution. Half cooked foods are sold to multiple SPPGs within a single region:A single supplier to multiple local kitchens; Save on transportation time and logistics expenses; Save on quality (freshness and food safety).)

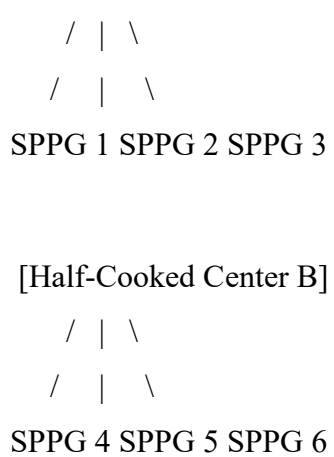
Example: 1 Half-Cooked Center = 3-5 SPPG in a certain radius.

SPPG (Operational Kitchen). Pay attention to:Final process (final cooking, e.g. frying); Presentation; Distribution to recipients. This renders it more functional:Quick,Regular,Minimal errors.

Consumers/Beneficiaries

Get products of standard quality, shorter distribution time and reduced chances of production mistakes.

Regional Cluster Model (Conceptual Illustration)



The benefits of this model: Operational Efficiency SPPG does not require an initial process; Quality Consistency Standardization at the supplier level; Logistics Distribution Efficiency by territorial proximity; Supply Chain Resilience There are alternative suppliers within the cluster; Scalability It is easy to enter into new territory.

Short Academic Narrative (Thesis optional). The supply chain model proposed takes a decoupling-point strategy, whereby the production process is subdivided into upstream (supplier half-cooked) and downstream (SPPG) phases. It enables greater operational efficiency, more centralized quality control and optimization of geographic cluster based distribution. In this way, the system is not only more responsive but also more responsive to the changes in the demand processes and supply interruptions.

Data-Driven Risk Management

In the face of high supply chain uncertainty, an integrated,data-driven risk management system is needed. This strategy enables organizations to actively address risk through the utilization of data as the main foundation of the risk identification, analysis, and mitigation process.

A risk management strategy that is based on data involves a number of important steps, which include risk identification, probability, and impact assessment, and the development of quantifiable mitigation strategies. Risk identification is whereby the possible supply chain disruptions are mapped such as fluctuation in prices of raw materials, delivery delays, production breakdowns and instability of the supplier. Moreover, risk analysis is performed on the basis of the historic data and analytical methods to identify the degree of probability of risk appearance and the scale of the effect of risk on the operations.

It is possible to predict possible disruptions early using the historical data and predictive analytics technologies, as well as other analytics technologies, which help the organizations to anticipate them in advance. The case in point is that the price fluctuation trends of staples can be examined to forecast the increase in prices, so that organizations can adopt early procurement strategies or long-term agreements with their suppliers. On the same note supplier performance data may be utilized to determine possible delays in supplies and identify more certain supplier alternatives.Moreover, by incorporating information systems into the

supply chain, real time monitoring of risks is achievable. Having a centralized monitoring dashboard, the organizations will be able to promptly identify irregularities in their operations and take corrective measures before the risk turns into a bigger disruption. This strategy also aids in greater supply chain visibility and coordination among units in responding to risks.

More objective and evidence-based decision-making is also a result of the implementation of data-based risk management. The decisions are no longer made out of the thin air but on a great deal of data which is measured and analyzed. This enhances precision of the strategies applied and minimizes the chances of errors in planning and operations.On the whole, the adoption of data-driven risk management is not only more effective in terms of helping an organization to predict and react to risks but also enhances the resilience and long-term sustainability of the supply chain.

Table 5.X Risk Register Supply Chain

Yes	Key Risks	Causes	Impact	Probability	Impact Level	Risk Level	Mitigation	PIC
	Fluctuations in raw material prices	Market instability, seasons	Increased operational costs	Height	Height	Height	Long-term contracts, supplier diversification	Procurement Team
	Supply delays	Low supplier performance, logistics	Production disruptions	Medium	Height	Height	Supplier evaluation, supplier alternatives	Supply Chain Manager
	Product quality inconsistencies	Variations of the production process	Decreased customer satisfaction	Medium	Height	Height	Standardization of SOPs, centralized QC	Quality Control
	Distribution disruption	Limited infrastructure, weather	Delivery delays	Medium	Medium	Medium	Route optimization, buffer stock	Logistics Team
	Limitations of trained human resources	Lack of training	Operational error	Height	Medium	Height	Continuing training program	HRD

	Single-supplier dependency	Lack of diversification	Risk of supply disruption	Height	Height	Height	Multi-sourcing, local supplier	Procurement
	Half-cooked quality risk	Supplier standards are not uniform	Product not up to standard	Medium	Height	Height	Supplier certification, periodic audits	QA/QC
	Request mismatch	Inaccurate forecasting	Over/under stock	Medium	Medium	Medium	Data-driven forecasting implementation	Planner
	Product damage during distribution	Inadequate packaging	Product disadvantages	Low	Medium	Low	Packaging standardization	Logistics
	Digital system failure	Unstable system	Operational disruptions	Low	Height	Medium	Backup system, IT support	IT Team

Risk Assessment Description

1. Probability: Low / Medium / High
2. Impact: Low/Medium/High
3. Risk Level: A combination of probability and impact

The risk register above shows that most major risks are in the high-risk category, particularly those related to raw material supply, product quality, and dependence on suppliers. This indicates that the main focus of risk management should be to strengthen the upstream side of the supply chain and standardize processes.In addition, the presence of risks related to half-cooked products underscores the importance of quality control at the supplier level, especially in the context of developing cluster-based supply chain models. With this risk register, organizations can be more systematic in prioritizing risk management and implementing targeted mitigation strategies.

CONCLUSION

1. Based on the results of the analysis that has been carried out using the SCOR, SWOT approach, and the formulation of supply chain strategies, it can be concluded that the supply chain system under review still faces a number of challenges, but also has great potential to be developed more optimally and sustainably.
2. The findings of the SCOR analysis indicate that the key weaknesses are absence of integration of planning, reliance on particular suppliers, differences in operational standards, inefficiencies in distribution, and poor evaluation and feedback systems. This situation suggests that extensive changes that involve planning, operations and supply chain performance control are necessary.
3. Meanwhile, the SWOT analysis also showed that the system also has its strengths being; national program support and extensive operation network, and tremendous opportunities due to the utilization of digital technology and empowerment of the local economy. Nevertheless, the internal weaknesses include the absence of system integration and a shortage of human resources and external threats that include price changes on basic materials and supply instability.
4. The supply chain strategy developed based on these two analyses was in terms of five key elements, i.e. integration of digital systems, simplification of operational SOPs, human resource capacity building, empowering local suppliers, and the introduction of data-based risk management. It is believed that the use of an integrated digital system will enhance visibility and coordination among processes, whereas making SOPs easier should streamline operations and make them more consistent.
5. One of the major strategies in enhancing supply resilience and distribution efficiency is the strengthening of the local suppliers particularly by establishing a supply chain model which is founded on semi-finished products and regional cluster approach. This model allows to more effectively split production process between suppliers and operational units (SPPGs), which enhances quality consistency, and makes the operational-level less complex.
6. Besides this, data-driven risk management should be implemented as it offers a more proactive aspect in predicting supply chain disruptions. Organizations can enhance decision-making

accuracy and make the system more resilient to uncertainty by using historical and analytical data.

7. In general, the research demonstrates that an integrated supply chain transformation, technology-driven, and facilitated by enhancing local ecosystems are the keys to the improvement of system performance, efficiency, and sustainability. When the implementation of strategies is correct, the supply chain can not only work more effectively but also be flexible towards environmental changes and the future.

Suggestions/Recommendations

According to the findings of the analysis and conclusions that have been drawn, the following strategic recommendations can be made to achieve better performance and resilience of the supply chain in a sustainable manner:

1. Introduction of Digital Systems. It is recommended that organizations should at once design and adopt an integrated supply chain information system. Such a system should be capable of integrating the entire processes, including planning and procurement, production, and distribution, on the same data-driven platform. The application of technologies like real-time monitoring, inventory management system and demand forecasting should be prioritized to enhance accuracy in planning and speed in decision making.
2. Standardization and Simplification of Operational SOPs. It is necessary to prepare SOPs that are simpler, standardized, and easier to implement in all operational units. This approach should be accompanied by consistent supervision to ensure uniformity of output quality. In addition, the half-cooked model needs to be integrated into the SOPs to reduce operational-level process complexity.
3. Strengthening Human Resource Capacity. Development of human resource competencies must be carried out on an ongoing basis through technical and managerial training programs. The focus of the training includes the use of digital technology, understanding of operational standards, and quality control. In addition, it is necessary to build an adaptive and performance-based work culture to support system transformation.
4. Development of Local Suppliers Based on Clusters. Organizations are advised to build a strong local supplier ecosystem through a regional cluster approach. Every supplier, especially

those who provide *half-cooked* products, needs to be adjusted to the service capacity of a number of kitchens (SPPG) within a certain radius. Supplier diversification is also needed to reduce dependency risk and increase supply resilience.

5. Implementation of Data-Based Risk Management. It is necessary to develop an integrated, data-driven risk management system to identify, monitor, and manage potential supply chain disruptions. The use of *dashboard* monitoring and predictive analytics can help organizations take preventive steps more quickly and precisely.
6. Enhancing Coordination and Governance. There is need to enhance coordination of the supply chain stakeholders by providing better structured and efficient communication channels. Moreover, a well-oriented governance such as the separation of roles and responsibilities will help to implement the strategy more optimally.
7. The following study is suggested, aimed at investigating quantitative characteristics, including measuring supply chain performance based on SCOR indicators in more detail, doing cost-logistics analysis, and modeling cluster-based distribution. This will give a more detailed image in serving the strategic decision-making.

By this recommendation, it is hoped that organizations will be able to make gradual, targeted changes to streamline the supply chain system. The key to the challenges and exploiting the opportunities of the future will be the implementation of an integrated, adaptive and data-driven strategy.

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