***ASJ**: International Journal of Sustainable Transport and Logistics (IJSTL)*
Vol. 02 (01) 30 April, 2025, Pp. 12 – 23
www.academiascholarlyjournal.org/ijstl/index_ijstl.htm
Also Available@: Archive.org/Eru_et_al.
Open access

Full Length Research

IMPACT OF SUPPLY CHAIN PRODUCTION PLANNING TECHNIQUES ON THE QUALITY OF TABLE WATER IN WARRI METROPOLIS, DELTA STATE, NIGERIA

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Accepted April 27, 2025

Supply chain planning has become indispensable to production firms in recent years due to the diverse and competitive markets that these firms operate in. Table water production is a very sensitive and complex market as producers must ensure topmost efficiency in both quality of products as well as meeting market demands. The main objective of this research was to examine the impact of supply chain production planning techniques on the quality of table water in Warri Metropolis. The basis of methodology was influenced by review of extant and related literature which justified the use of variables and statistical tools to examine the PUSH, PULL or PUSH-PULL techniques as applicable in the supply chain production planning process. The data was primary in nature and was sourced using a properly structured questionnaire. The population of the study included 400 targeted personnel, including owners and operators, from table water plants in Warri metropolis. Sampling was done using the Taro Yamane technique and 200 samples were used. The methods of data analysis involved descriptive statistics such as the percentage frequency, as well as the Ordinary Least Squares (OLS) regression technique which was used to test the hypothesis of the study. At 5% level of statistical significance, Control of the supply chain planning (p-value:0.050); Integration with supplier (p-value:0.015); Strategic distribution planning (p-value: 0.000); and supply Chain Decisions (p-value :0.04, all indicate positive impacts on supply chain performance. Collaborative Supply Chain Planning also has a positive impact on supply chain performance though not statistically significant with p-value of 0.121. Based on these results, the null hypothesis which states that there is no significant relationship between the supply chain production planning techniques used and the quality of water sold to final consumers by table (pure) water plants in Warri metropolis, was rejected. Thus, the study concludes that supply chain production planning techniques impact significantly on the quality of table water in the study area. It is recommended that operators in the water production industry should receive at least one form of formal training and production planning must be prioritized.

Keywords: Supply Chain, Production Planning, Push-Pull, Quality, Table Water, Regression.

INTRODUCTION

Many companies now use supply chain planning in an effort to cut down on supply chain expenses as a result of increased competition brought on by globalization. Businesses rely on supply chain management to smoothly coordinate all aspects of the production process, from the sourcing of raw materials to the completion of processing and shipment. The production, shipping, and receiving phases of a product's life cycle are all determined by its supply chain. This is a difficult endeavour that necessitates extensive planning for the future to accommodate for any setbacks and fluctuations. Planning inventory for optimal efficiency, businesses might use push and pull tactics in supply chain logistics. Products in a push-based supply chain are forcibly moved from the manufacturing stage to the retail stage. This means that production is executed in response to anticipated levels of demand. The Material Requirements Planning (MRP) method is used by a corporation operating under the push system to anticipate consumer demand and ramp up production accordingly. The "Just-in-Case" principle is related to this. Instead of basing decisions on forecasts, a pull-based supply chain responds to actual customer demand. The required quantity and timeline of outputs are met. Products with low demand uncertainty or high importance of economies of scale in cutting costs benefit greatly from the push approach. The pull supply chain bases production and distribution on actual demand from customers. In this method of logistics for the supply chain, items are purchased just as they are needed. Simply said, the Pull System is a type of "Just-in-Time" production that waits to make an item until an order is placed. The pull method does not rely on demand forecasting, instead producing just when necessary.

Lockamy and McCormack (2014) define supply chain planning as "the part of Supply Chain Management (SCM) concerned with anticipating future requirements in order to strike a balance between supply and demand." In order to meet customer needs, businesses need to be able to see what those needs are in advance and figure out how best to meet them using the enterprise's supply and production assets.

There are many table-water companies that are licensed to work and operate in Warri metropolis. They engage in the packaging of water in plastic bottles as well as in sealed nylon known as sachet water, more commonly referred to as ‘pure water’ which is more common because of its affordability by the masses. The importance of the Table water plants in Warri to the economy of Nigeria cannot be overstated. They generate revenue to the government through taxes; create employment to the local people in the product manufacturing, packaging and distribution to the retail outlets (Obaga et al., 2013).

However, Members Directory (2008) notes that these Table water plants confront a number of obstacles, including timely delivery of goods and services, a lack of cutting-edge technology, intense rivalry, and a disorganised supply chain. The efficiency of the supply chain could suffer as a result of this. Customers have high expectations that stores will meet their needs in terms of inventory, location, timing, and cost (Oliver, 1993). In order to boost supply chain efficiency, water bottling firms should think about applying supply chain planning.

According to Kerbachea and Macgregor (2014), businesses that adopt supply chain methodology and discipline, encouraged by a framework-based approach, become more flexible and better equipped to adapt to new circumstances.

A look at the distribution chain of table water around the Warri metropolis, leaves one wondering what technique the producers use; whether they have the knowledge of the push and pull production techniques, and if they do, do they apply them, or a mix of the two - hybrid push-pull technique?

The use of standardized supply chain management techniques can help to reduce or possibly eliminate the cause of stale or awful taste from table water, especially the sachet pack supplied to final consumers, because good water ought to be tasteless and odourless. The lack of freshness in certain brands of sachet water suggests that the plants just produce with the hope of selling all quickly, but this may turn out to be difficult because of proliferation of producers, leading to long storage and deterioration. With the knowledge of good production planning and application of the right technique, the right quantity to meet effective customer demand would be produced. This research therefore, targeted a probe into the technique used and how it impacts on the quality of the water supplied to the final consumer, and with a view to proffering solutions that would enhance quality and cost effectiveness. As a result, the industry as a whole will benefit from increased professionalism and standards, and practitioners' bottom lines will see an uptick as more demand data becomes available and they are better able to meet consumer needs. The research objective of the study is to examine the awareness of PUSH, PULL or PUSH-PULL techniques as applicable in the supply chain production planning process among the operators of table water plants in Warri metropolis.

The null hypothesis states that “there is no significant relationship between the supply chain production planning techniques used and the quality of water sold to final consumers by table (pure) water plants in Warri metropolis”.

LITERATURE REVIEW

Supply chain performance is defined by Stewart (2015) as the degree to which a company is able to respond to and fulfil the demands of its customers in a timely fashion by making the products their customers require easily accessible. It involves a continuous process that requires both an analytical performance monitoring system, and a mechanism to trigger measures for realising key performance metrics. Key performance indicators, such as inventory carrying cost, inventory turnover, order monitoring, and back-order rate, are achieved by a process called "KPI attainment," (Gunasekaran and McGaughey 2014).

To combat the difficulties of supply chain management and fulfil consumer demands, Lee and Kim (2019) argued that supply chain planning is a crucial component. This is so because, as Pavel (2015) explains, a solid supply chain framework may help supply chain departments like transportation, inventory management, and logistics stay on track while the company plans for the future. Hokey and Zhou (2019) noted the complexity of coordinating supply chain planning across business units and departments. Although there may be some divergence in the expectations, goals, and preferences of different functional areas when looking at supply chain planning activities, factors such as cost-effectiveness, process efficiency, and cycle time are universally important.

Hokey and Zhou (2019) noted that most businesses are switching from a "push" to a "pull" business model to handle the complexities of the global market. Products in the push business model are planned, developed, and marketed in advance and then pushed out to customers. According to the pull business model, decisions about what to make, buy, and how much to store are all based on signals from customers.

This study related the practice of supply chain production planning management to two theories - the theory of constraints and the knowledge-based view:

Theory of Constraints

Based on the research of Boyd and Gupta (2014), the theory of constraints, is a management paradigm that holds that each controllable system is constrained from accomplishing more of its goals by a relatively small set of barriers. According to Davies et al. (2015), there is always one restriction, and this theory uses a forecasting process to isolate the constraint and reorganise everything else accordingly. The idea assumes that throughput, operating expense, and inventory are the key metrics by which businesses can be evaluated and managed. According to Ehie and Sheu (2015), a system's inventory is the sum total of the cash it has spent on goods it plans to sell. The sum total of a system's outlays for converting stock to output is known as operational expense. The rate at which a system makes revenue from sales is called its throughput. In order to get where you want to go, you have to make sure a few things are in place.

Boyd and Gupta (2014), further posited that unanticipated barriers might impede progress towards an organization's goals if its leaders don't invest in future planning. The theory is important because it educates top-level executives on the significance of strategic supply chain planning (Davies, 2016). This is crucial since it allows a business to anticipate demand. Supply chain efficiency will improve as a result of being able to better satisfy the needs of a growing customer base and avoid losing money due to stock outs, delays in production, and a decrease in inventory (Benton, 2017).

Knowledge-Based View

The knowledge-based perspective also takes into account an organization's intangible assets. Organizational learning, organisational skills, and competences are only few of the areas this theory examines as they relate to the evolution of this perspective. The goal of this theory is to increase productivity and the production of new value through the dissemination of information. Ketchen and Hult (2017) stressed the importance of internal and external organisational supply chain collaboration for value development. Organizational supply chain performance was examined from a knowledge-based perspective by Hult, et al. (2014). The knowledge-based view allowed them to describe the large variation in cycle time of supply chain performance across organisations. This demonstrates the importance of information exchange in enhancing supply chain efficiency. Incorporating information sharing into supply chain planning at the organisational level is highlighted by this notion. The company should regularly engage in knowledge sharing with its supply chain partners. This increases the efficiency of the supply chain as a whole by reducing the time and money needed to make decisions.

An empirical background to this study was gained from the works of some researchers. Lee and Kim (2019) looked into how production distribution planning affects UK manufacturers' output and profitability. There was research done on the causes and effects in a group of 55 manufacturing companies. Primary data was acquired via a semi-structured questionnaire, and secondary data was gleaned from publicly available sources including financial statements. According to the results of a correlation study, there is a beneficial effect of production distributions planning on the financial outcomes for manufacturing businesses. Manufacturing company performance and supply chain planning were the focus of a study by Lockamy and McCormack (2014). Primary data was gathered by use of a questionnaire to conduct a cross-sectional survey. Supply chain planning and manufacturing business performance was investigated using a regression model. Based on the findings, supply chain planning improved supply chain performance. Supply chain integration and performance in humanitarian organisations and East African Breweries Limited (EABL) have been the subject of research by Lisanza (2013) and Njoroge (2017). SCM integration was found to have a favourable effect on the performance of both East African Breweries Limited and humanitarian groups. Integration and efficiency in the supply chain were the primary research foci. The correlation between supply chain strategy and efficiency was not investigated.

Table water plants in Warri metropolis were analysed in a study by Ijeoma (2010) to determine the effects of an integrated supply chain on plant efficiency. Supply chain integration was proven to boost performance, according to the study.

According to Karimi and Rafiee (2019), there are many facets to the supply chain that are taken into account while implementing management methods. Upstream is covered by strategic alliances with suppliers, while downstream is handled through relationships with customers. When it comes to internal supply chain processes, the main focus is on delays in the supply chain, but the component of information flow seeks to determine how much and how well information is transmitted throughout the entire supply chain. Given the fluidity of supply networks and the ever-evolving nature of business processes, these links in the chain should not be treated as definitive.

According to research conducted by Lenny et al. (2020), there are ties between Supply Chain Management (SCM) practices, operational performance, and SCM-related organisational performance. Information was gathered from 203 small and medium-sized enterprises (SMEs) in Istanbul, Turkey, that produce fabricated metal goods and general-purpose machinery. There was a favourable and statistically significant effect of SCM practises on operational performance, but no such effect was observed for SCM-related organisational performance.

METHODOLOGY

The research method utilised in this study was a descriptive cross-sectional survey. This design was appropriate because it was helpful in establishing the nature of the current situation and analysing such situation and conditions for, according to Kothari (2016), cross-sectional studies are essential where the overall objective is to find out whether there are any association between variables. The target population of this study consisted of 400 table water plant owners and operators in Warri metropolis. The sample size for the study was arrived at using the Taro Yamane technique. The likelihood that this formula is correct is assumed to be greater than zero. The use of a descriptive survey design and a correlation and regression model is encouraged when employing this technique (Kelly and Maxwell, 2016). The Taro Yamane technique is best used for obtaining a representative sample from a finite or known population, and this aligns with the primary aim of a descriptive survey design, which is to capture a population's characteristics. Additionally, correlation and regression analyses are inferential statistical techniques that are highly reliant on data from a sample that adequately represents the population in order to accurately explore and quantify relationships between variables. Therefore, as Kelly and Maxwell (2016) argued, in order to ensure methodological coherence, using sample sizes gotten from probability-based sampling techniques like Taro Yamane improves the power and reliability of correlation and regression models.

The formula is given as:

$$n = \frac{N}{1+N(e)^2}$$

Where;
n - Sample Size
N – Population Size
e – Precision Level (0.05)
A Precision level of 0.05 is chosen because the researcher has chosen a 95% confidence level for the study. There are three widely-acceptable precision or significance levels in quantitative analyses which are the 1%, 5% and 10% levels which coincide with 99%, 95% and 90% confidence levels respectively. The choice of 95% confidence level implies that we are 95% certain that the sample size obtained from this technique would adequately represent the population, and by implication, whatever findings that are made from the data analyses can be generalized for the entire population. Since the 95% level of significance is used, the 5% (or 0.05) precision or significance level will be used in the formula.

Therefore, with a population size of 400, the sample size is determined using the Taro Yamane technique as follows:

$n = 400 / 1 + 400 (0.05)^2$
$n = 400/1 + 400 (0.0025)$
$n = 400/2$
$n = 200$

With the above, we have a sample size of 200 respondents and this is the sample size that was used for the study. The instrument for Data collection was a structured questionnaire developed by the researcher for data collection.

The primary sources for this study were the production and supply chain managers as a subset of Warri city's table water plant facilities. The researchers considered these participants to be significant respondents because of their extensive experience with supply chain planning and their awareness of the difficulties inherent in putting these strategies into use.

Both descriptive and analytical methods were used to analyse the data collected. Data from part A of the questionnaire showing bio-data were vividly presented in tables.

To test the hypothesis of this study, a regression model was employed. The model consisted of seven independent variables and a dependent variable: The independent variables were supply chain planning practices while the dependent variable was supply chain performance.

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e$$

Where:
Y= Supply chain performance = Final Quality of Sachet water
X_1= Integration with supplier
X_2=Demand management process
X_3= Control of the supply chain planning
X_4= Collaborative Supply Chain Planning
X_5= Supply Chain Decisions
X_6= Strategic distribution planning
X_7= Strategic Warehouse and Design
β_0 and X = Regression Constants
e = Error term.

The study used the linear regression model to show the relationship between supply chain planning practices and supply chain performance which dictates the quality of water (mostly sachet water) supplied to the final consumer from the table water plants.

RESULTS AND DISCUSSION

The results are presented under various subheadings as addressed by the research objective and hypothesis. Data were obtained from two hundred (200) respondents out of a total of two hundred (200) questionnaires distributed, indicating a 100% response rate. In analyzing the questionnaire, descriptive statistics such as the percentage frequency and arithmetic mean were used, while the regression technique was used to test the hypotheses.

Table 1. Responses to Awareness of Push, Pull and Push-Pull Techniques.

S/N	Awareness of Push, Pull and Push-Pull Techniques	SA	A	D	SD	DN
1	The workers of this company are very much aware of supply chain production planning techniques.	74	60	40	20	6
2	All the staff here have heard of the Push, Pull and Push-Pull Supply Chain Production Planning Technique.	47	81	38	26	7
3	The Production staff here have good knowledge of the Push, Pull and Push-Pull Supply Chain Production Planning Technique.	53	76	39	22	8
4	I have attended formal training where Supply Chain Production Planning techniques including Push and Pull techniques were explained in detail.	57	63	31	37	9

Source: Author's Computation from field work.

Research Objective - To examine the awareness of PUSH, PULL or PUSH-PULL techniques as applicable in the supply chain production planning process.

In analyzing this objective, the questionnaire was used, as presented in Table 1. From Table 1, it can be seen that 74 respondents strongly agreed that they are aware of supply chain production planning techniques, 60 respondents agreed with the assertion, 40 disagreed while 20 strongly disagreed. However, 6 respondents remained neutral to the statement. From the question 2 which states that all the staff have heard of the Push, Pull and Push-Pull Supply Chain Production Planning Technique, 47 strongly agreed, 81 agreed, 38 disagreed, and 26 strongly disagreed while 7 remained neutral.

In terms of having good knowledge about the Push, Pull and Push-Pull Supply Chain Production Planning Technique, 53 respondents strongly agreed, 76 agreed, 39 disagreed while 22 strongly disagreed. Only 8 respondents were neutral to the assertion.

Finally, from question 4 which stated that respondents have attended formal training where Supply Chain Production Planning techniques including Push and Pull techniques were explained in detail, 57 respondents strongly agreed, 63 agreed, 31 disagreed, 37 strongly disagreed while 9 respondents were neutral to this statement.

Regression Estimate

The test of hypothesis was done using the Ordinary Least Squares regression technique. The statistical significance of the coefficients was determined by the probability values (p-values) of the t-statistic. Therefore, using a 5% (0.05) level of significance, if the p-value is less than 0.05, the coefficient of the variable is statistically significant and if the p-value is larger or greater than 0.05, the variable's coefficient is not statistically significant.

For the variables, the dependent variable, supply chain performance was proxied using Q14 on the questionnaire.

For the independent variables:

Q5= Integration with supplier
Q7=Demand management process
Q1= Control of the supply chain planning
Q9= Collaborative Supply Chain Planning
Q16= Supply Chain Decisions
Q8**=** Strategic distribution planning
Q3= Strategic Warehouse and Design

The regression estimate is shown in Table 2. From the coefficients in Table 2, it can be seen that integration with supplier (Q5) has a positive impact on supply chain performance. With a p-value of 0.015, it shows that this impact is statistically significant at a 5% level of significance. Demand management process (Q7) on the other hand has a negative impact on supply chain performance, however, with a probability value of 0.177, the impact is not statistically significant at a 5% level of significance. Control of the supply chain planning (Q1) has a positive impact on supply chain performance and with a p-value of 0.050, it shows that this impact is statistically significant at a 5% level of significance.

Collaborative Supply Chain Planning (Q9) also has a positive impact on supply chain performance but is

Table 2. Regression Estimates.

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t-stat	p-value
		B	Std. Error	Beta		
1	(Constant)	1.400	.369		3.795	.000
	Q5	.131	.054	.164	2.443	.015
	Q7	-.094	.070	-.092	-1.353	.177
	Q1	.152	.077	.198	1.976	.050
	Q9	.100	.064	.109	1.557	.121
	Q16	.138	.048	.195	2.889	.004
	Q8	.277	.062	.309	4.462	.000
	Q3	-.033	.078	-.043	-.423	.673
R-Squared (R^2) - 0.278 Adjusted R-Squared- 0.251			Std. Error of the Estimate - 2.41966 F-stat - 10.539 Sig. (F-stat)- 0.000			
Dependent Variable: Q14			Durbin-Watson - 1.581			

Source: Author's Computation using SPSS

not statistically significant at the 5% level.

Supply Chain Decisions (Q16) has a positive impact on supply chain performance and with a p-value of 0.04, it is statistically significant at the 5% level. Strategic distribution planning (Q8) also has a positive and significant impact on supply chain performance. Strategic Warehouse and Design (Q3) however is seen to have negative impact on supply chain performance. Although this impact is not statistically significant at the 5% level.

The intercept (or constant) value of 1.400 implies that holding the independent variables constant, or if they are excluded from the model, supply chain performance would still be positive. The intercept is also statistically significant.

The F-statistic of 10.539 shows that the overall model is valid and statistically significant due to its p-value of 0.000.

The null hypothesis states that there is no significant relationship between the supply chain production planning techniques used and the quality of water sold to final consumers by table (pure) water plants in Warri metropolis. From the regression estimate, it can be seen that integration with supplier, control of the supply chain planning, supply chain decisions and strategic distribution planning all have statistically significant impacts on supply chain performance thus the null hypothesis is rejected.

DISCUSSION OF FINDINGS

The descriptive statistics showed that in terms of Push, Pull and Push-Pull techniques, 73% of the respondents agreed that they have the awareness and knowledge of these supply chain production planning techniques. Also, a significant number of respondents have undergone formal training on supply chain production planning techniques, which aligns with Lee and Kim's (2019) findings that majority of the stakeholders in supply chain production planning usually undergo relevant formal trainings. The findings also revealed that plant operators and owners favour supply chain production techniques either in the form of first-in-first-out (FIFO) or last-in-first-out (LIFO) techniques, corroborating the works of Scott et al. (2016), who asserted that supply chain techniques provide a systematic way to ensure logistic issues associated with the supply and free flow of goods are solved.

The positive impact of integration with suppliers on supply chain performance, affirms the findings of Kim (2019) that there are benefits of supplier collaboration in improving goods supply and reducing scarcity, leading to the satisfaction of customers. Control over supply chain planning exhibited a positive and significant impact, reinforcing Ketchen and Hult (2017) assertion that effective planning enhances performance. Collaborative planning, strategic decisions and distribution planning, all yielded significant positive effects on performance, echoing Kamau's (2015) findings which stressed the importance of supply chain planning practices in improving supply chain performance.

Collectively, these findings show that robust supply chain planning contributes significantly to improved supply chain performance.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This study has focused on determining the impact of supply chain production planning techniques on the quality of table water in Warri Metropolis, Delta State, Nigeria. Supply chain production planning techniques are very vital for any production firm and once these plants detect the supply chain technique that syncs their production schedule with distributors and customers' needs, supply chain performance as a whole is improved. One central theme in this study's findings is that proper production planning and management will culminate to positive supply chain performance. However, some of the key highlights of the findings show that integration with suppliers, collaborative supply chain planning and supply chain decisions impact overall supply chain performance positively and significantly. The study thus concluded that supply chain production planning techniques impact significantly on the quality of table water in the study area.

POLICY RECOMMENDATIONS

In light of the findings, the following recommendations are proffered:

i. Factories or producers should ensure to carry out post-production monitoring to ensure that their brand's quality is maintained till the products get to the final consumers. This can be achieved by introducing quality audit checkpoints and using technology like GPS tracking and temperature sensors during distribution. This recommendation is related to the research in that it addresses the finding that improved supply chain planning significantly enhances product quality. Monitoring ensures that the benefits of proper planning extend to the final stage, which is consumer satisfaction.

ii. Electricity supply should be improved in industrial areas. Also, for the firms that can afford it, renewable energy options should be explored to save energy costs and at the same time guarantee stable power supply. Producers should partner with local government and power distribution companies to prioritize industrial zones for power supply. In addition, companies can conduct feasibility studies on renewable options like solar or hybrid systems to reduce reliance on the national grid. The relation of this recommendation to the research is that unstable electricity affects production consistency and logistics which are critical components of the supply chain. This supports the research's focus on improving supply chain efficiency to ensure quality table water.

iii. For operators and owners in the table water production industry, some form of formal training is very essential and they must ensure they have at least one form of formal training. Stakeholders in the industry, including associations and NGOs should organize periodic workshops and certification programs. Firms should require at least one certified staff member in supply chain planning. The above recommendation is related to the research because it supports the assertion that trained personnel contribute significantly to effective use of supply chain techniques, which positively impacts performance and water quality.

iv. Regulatory authorities should ensure that formal trainings for operators are made mandatory and also train field monitoring officers that would make sure that best practices are maintained from the production to distribution stages. Regulatory bodies like NAFDAC and SON should revise guidelines to include mandatory training and periodic re-certification for table water operators. They should also recruit and train field officers to enforce compliance through regular inspections. The relevance of this recommendation to the research is based on the finding that consistent application of supply chain techniques and best practices, supported by training and monitoring leads to better supply chain performance and higher-quality products.

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Appendix

QUESTIONNAIRE

SECTION A: BIO-DATA

INSTRUCTION: Please (√) as appropriate in the boxes provided.

Name of Plant or Product…………………………………………………………....

Position held………………………………Department…………………………

Age: < 20 | 20 - 29 | 30 - 39 | 40 - 49 | 50 - 59 | >60 Gender: M | F

Educational Qualification: FSLC | SSCE | OND | Bachelors | Masters | PhD | None

How long have you worked here? < 1yr | 1-2yrs | 2-3yrs | 3-4yrs | 4-5yrs | 5-6yrs | 6-7yrs | 7-10yrs | >10yr

Have you received any formal training in Table water production? YES | NO

SECTION B: RESEARCH QUESTIONS

INSTRUCTION: Please tick (√) as appropriate

KEY:
Strongly Agree (SA)
Agree (A)
Disagree (D)
Strongly Disagree (SD)
Don't Know (Neutral) (DN)

S/N	Awareness of Push, Pull and Push-Pull Techniques	SA	A	D	SD	DN
1	The workers of this company are very much aware of supply chain production planning techniques					
2	All the staff here have heard of the Push, Pull and Push-Pull Supply Chain Production Planning Technique.					
3	The Production staff here have good knowledge of the Push, Pull and Push-Pull Supply Chain Production Planning Technique.					
4	I have attended formal training where Supply Chain Production Planning techniques including Push and Pull techniques were explained in detail.					

S/N	Uses of SC Production Planning Techniques	SA	A	D	SD	DN
5	We produce the exact quantity that our customers demand and no left overs in our store					
6	We produce enough and sell as much as we can and store the rest until we have demand for them.					
7	We always produce to have enough in stock even when demand is low.					
8	We encourage our distributors to buy and stock in their warehouses to avoid scarcity.					

S/N	Quality Control	SA	A	D	SD	DN
9	We encourage our distributors to buy and stock in their warehouses to avoid scarcity, while we keep supplying to them.					
10	We allow our distributors to return unsold stale and contaminated water in their warehouses and we replace it for them at no extra cost.					
11	Once we supply our distributors, the responsibility of quality control rests on them and we do not have to monitor how long they stock the water.					
12	It is not our duty to carry out non-contamination inspection of distributors' transport trucks or boats that deliver our water to final consumers.					

S/N	Application of Supply Chain Techniques	SA	A	D	SD	DN
13	We rely on the first-in-first-out techniques					
14	We usually produce to specification and so no need to monitor our techniques					
15	We usually adopt the last-in-first-out techniques					
16	We are not aware of any special Supply Chain technique for table water production so do not apply any; we just produce.					

S/N	Challenges facing Implementation of the SCT	SA	A	D	SD	DN
17	No challenges, as our techniques work out fine					
18	Local Government laws and high taxes affect our production level and profit margin adversely.					
19	Production doesn't match the required demand					
20	High cost of production due to lack of public power supply which also hampers effective production planning.					