

A VALUE CHAIN ANALYSIS OF SOLID LIQUID SEPARATOR INDUSTRY IN GUJARAT

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ABSTRACT

This paper presents a meticulous examination of the value chain within the Solid Liquid Separator (SLS) industry, aiming to illuminate the intricate interplay of activities and stakeholders involved in the production and distribution of these crucial separation systems. Employing a value chain analysis framework, we dissect each stage of the SLS value chain, from raw material sourcing to end-user delivery, identifying key processes, actors, and value-added activities. Furthermore, this study explores the critical factors influencing the competitiveness and sustainability of the SLS industry, including technological advancements, regulatory frameworks, and market trends. By synthesizing insights from diverse disciplines such as engineering, business, and environmental science, this analysis offers valuable perspectives for stakeholders seeking to optimize their operations and navigate the evolving landscape of the SLS market.

Keywords: Solid Liquid Separator, Value Chain Analysis, Industry Dynamics.

Introduction

The solid-liquid separation process is fundamental to various industries and encompasses a wide range of techniques and equipment. The importance of efficient separation in terms of cost savings, environmental compliance, and product quality.

Background of the Study

The solid-liquid separation industry plays a pivotal role in numerous sectors, including wastewater treatment, pharmaceuticals, mining, and food processing. Efficient separation processes are critical for environmental protection, resource recovery, and product quality. However, despite significant progress, challenges persist in achieving higher efficiency, reduced energy consumption, and minimal environmental impact. This research paper aims to address these challenges and explore emerging opportunities in the field of solid-liquid separation.

What is a value chain?

The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.

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- **Value Chain Analysis**

The value chain in the context of solid-liquid separation involves several stages, including design, manufacturing, distribution, installation, operation, and maintenance. Each stage has its unique challenges, opportunities, and stakeholders.

- **Technological Advances**

Reviewing the evolution of solid-liquid separation technologies, from basic filtration to advanced techniques such as centrifugation, membrane filtration, and sedimentation. Assessing how technological advancements have improved efficiency, reduced energy consumption, and enhanced separation performance.

- **Market Trends and Drivers**

Identifying market trends and factors driving the demand for solid-liquid separation machines, such as stricter environmental regulations, increasing industrialization, and water scarcity concerns. The role of globalization and the expansion of emerging markets in shaping the industry.

- **Environmental Considerations**

Analysing the environmental impact of solid-liquid separation processes and machinery. The adoption of sustainable practices, such as reducing energy consumption, minimizing waste generation, and recycling, in the context of the value chain.

- **Quality and Process Optimization**

Examining the importance of achieving high-quality separation in various industries and how it impacts the overall value chain. The role of process optimization and automation in ensuring consistent and efficient separation.

- **Case Studies and Best Practices**

Highlighting case studies of successful implementations of solid-liquid separation machines in different industries. Identifying best practices and lessons learned from these cases.

- **Challenges and Future Directions**

Discussing the challenges faced by the solid-liquid separation machinery industry, such as competition, cost pressures, and adapting to new technologies. Speculating on the future directions of the field, including potential innovations and emerging technologies.

Literature Review

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. - Michael Porter's seminal work where he introduced the concept of the value chain and discussed its role in competitive advantage.

Elements in Porter's Value Chain

Rather than looking at departments or accounting cost types, Porter's Value Chain focuses on systems, and how inputs are changed into the outputs purchased by consumers. Using this viewpoint, Porter described a chain of activities common to all businesses, and he divided them into primary and support activities.

Value Chain analysis and Competitive Advantage

Journal of General Management

Prescott C. Ensign

The linkages in value chains can be finely tuned to gain a competitive edge. All firms make decisions that affect their competitive position and profitability. Strategic planning is the organizational process of making these important decisions. It is undertaken in an effort to help the firm position itself against its competitors in the pursuit of competitive advantage. Porter suggests that value chain analysis can be a useful approach in developing strategy.

Value chain analysis can be used to formulate competitive strategies, understand the source(s) of competitive advantage, and identify and/or develop the linkages and interrelationships between activities that create value. This paper offers a better understanding of the kinds of linkages and interrelationships that exist or can be developed between value chain activities.

Dimensions of Sustainable Value Chains: Implications for Value Chain Analysis Andrew Fearné & Marian Garcia

Kent Business School, University of Kent Ben Dent

- **School of Integrated Systems, University of Queensland Purpose:** Value Chain Analysis (VCA) can expose strategic and operational misalignments within chains, and the consequential misallocation of resources, and hence opportunities for improvements which create value and economic sustainability. This paper's purpose is to argue why and how VCA needs to integrate the social and environmental aspects of sustainability in pursuit of sustainable competitive advantage.
- **Design/methodology/approach:** Based on a review of existing methods and case studies, the paper proposes three dimensions of VCA, which illustrate the flaws in narrow tools, and the need to broaden the boundaries of VCA, the interpretation of 'value' and relationships along the chain in order to highlight opportunities for creating sustainable value chains.
- **Findings:** To date VCA has largely focused on economic sustainability and paid inadequate attention to social and environment consequences of firm behaviour and the (re) allocation of resources within and between firms in the chain. This risks producing recommendations which either ignore the competitive advantage offered from improving environmental management and social welfare, or have such detrimental external consequences as to render any proposals unsustainable when exposed to government or broader (public) scrutiny.

Combining the Global Value Chain and global I-O approaches Discussion Paper

Dr. Stacey Frederick Research Scientist

Center on Globalization, Governance & Competitiveness (CGGC), Duke University Durham, NC USA

This discussion paper describes the existing gap between the work of traditional global value chain (GVC) academics and that of economists, international NGOs and statistical agencies analyzing global production fragmentation.

Whereas both groups are engaging in research that seeks to explain why and how production of goods and services is dispersed around the world, the two groups have different objectives for their work and use different types of data to conduct analysis.

Research Methodology

Objectives of the Study

- To identify Primary & Support activities of Value Chain.
- To assess Primary & Support activities of Value Chain.
- To explore key challenges & issues regarding the Value Chain.

Research Design

This study will use a descriptive research design to analyse a value chain of Rotofilt Engineers Ltd. Descriptive research is a type of research that aims to describe a phenomenon as accurately and objectively as possible. It is a good fit for this study because it will allow us to collect data on a large sample of customers and to identify the most common attitudes and perceptions towards Value Chain Analysis.

Data Analysis

Allocation of Procurement to Primary activities.(Ratings)

Allocation	Very High	High	Average	Low	Very Low
Inbound Logistics	17	17	3	1	0
Operations	21	11	5	0	0
Outbound Logistics	22	12	4	0	0
Marketing And Sales	24	9	4	1	0
Services	24	10	3	1	0

Allocation of Procurement to Primary activities (Scores).

Particular	Calculations	Scores
Inbound Logistics	$17*5 + 17*4 + 3*3 + 1*2$	164
Operations	$21*5 + 11*4 + 5*3$	164
Outbound Logistics	$22*5 + 11*4 + 5*3$	170
Marketing And Sales	$24*5 + 9*4 + 4*3 + 1*2$	170
Services	$24*5 + 10*4 + 3*3 + 1*2$	171

Here it is found that allocation of Procurement is similar in Inbound Logistics and Operations where as outbound logistics, Marketing And sales and Services have similar allocation.

Allocation of Tech development to Primary activities. (Ratings)

Allocation	Very High	High	Average	Low	Very Low
Inbound Logistics	16	19	2	1	0
Operations	19	16	3	0	0
Outbound Logistics	25	11	2	0	0
Marketing And Sales	21	13	3	1	0
Services	23	14	0	1	0

Allocation of Tech development to Primary activities.(Scores)

Particular	Calculations.	Scores
Inbound Logistics	$16*5 + 19*4 + 2*3 + 1*2$	164
Operations	$19*5 + 16*4 + 3*3$	168
Outbound Logistics	$25*5 + 11*4 + 2*3$	175
Marketing And Sales	$21*5 + 13*4 + 3*3 + 1*2$	168
Services	$23*5 + 14*4 + 1*2$	173

Here it is found that allocation of Tech Development is similar in Inbound Logistics, Operations and Marketing And sales where as Outbound logistics and Services have similar allocation.

Allocation of Human Resource Management to Primary activities. (Ratings)

	Very High	High	Average	Low	Very Low
Inbound Logistics	13	20	5	0	0
Operations	19	15	4	0	0
Outbound Logistics	19	14	5	0	0
Marketing And Sales	18	16	3	1	0
Services	22	11	5	0	0

Allocation of Human Resource Management to Primary activities. (Scores)

Particular	Calculations.	Scores.
Inbound Logistics	$13*5 + 20*4 + 5*3$	160
Operations	$19*5 + 15*4 + 4*3$	167
Outbound Logistics	$19*5 + 14*4 + 5*3$	166
Marketing And Sales	$18*5 + 16*4 + 3*3 + 1*2$	165
Services	$22*5 + 11*4 + 5*2$	164

Here it is found that allocation of Human Resource Management is similar in Inbound Logistics, Operations, Marketing And sales, Outbound logistics and Services

Allocation of Firm Infrastructure to Primary activities.(Ratings)

	Very High	High	Average	Low	Very Low
Inbound Logistics	20	14	4	0	0
Operations	22	11	3	0	0
Outbound Logistics	19	14	4	0	0
Marketing And Sales	20	12	5	0	0
Services	25	8	4	0	0

Allocation of Firm Infrastructure to Primary activities.(Scores)

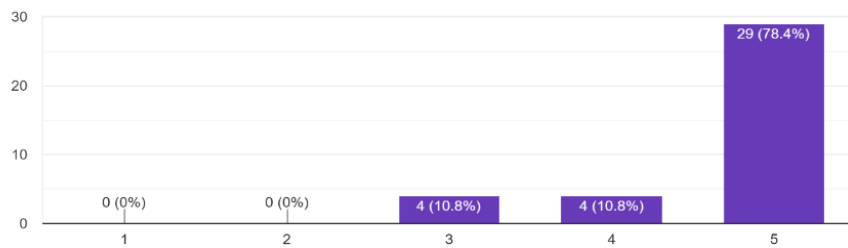
Particular	Calculations.	Scores
Inbound Logistics	$20*5 + 14*4 + 4*3$	168
Operations	$22*5 + 11*4 + 3*3$	163
Outbound Logistics	$19*5 + 14*4 + 4*3$	163
Marketing And Sales	$20*5 + 12*4 + 5*3$	179
Services	$25*5 + 8*4 + 4*2$	169

Here it is found that allocation of Firm Infrastructure is similar in Inbound Logistics, Operations, Outbound logistics and Services.

Contribution of support activities with reference to primary activities.

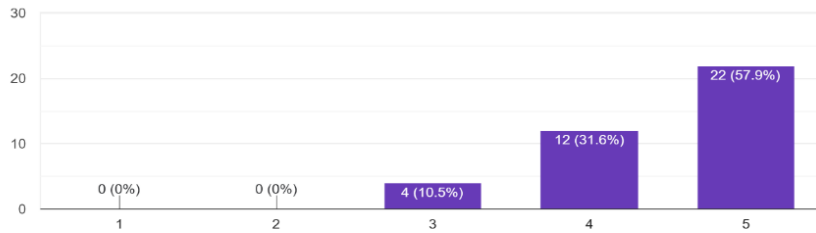
INBOUND LOGISTICS

Procurement.
37 responses



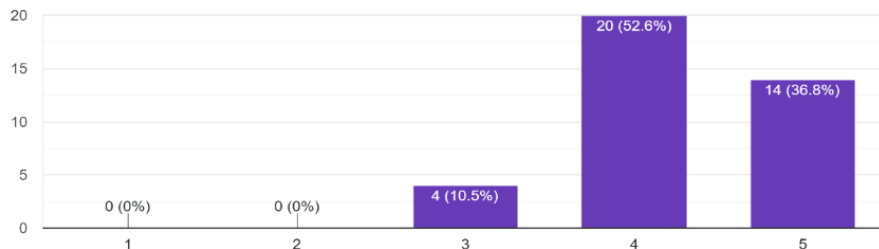
The above graph shows the Contribution of Inbound Logistics to Procurement where out of 37 responses, 29 (78.4%) responded to Excellent, 4 (10.8%) responded to Good and 4 (10.8%) responded to Average.

Tech. Development
38 responses



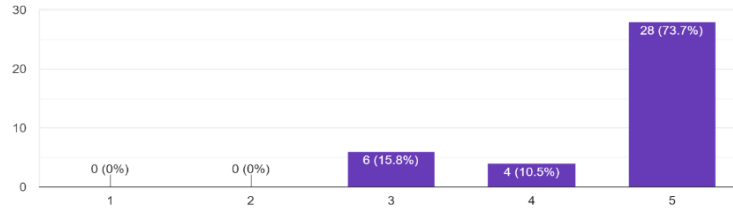
The above graph shows the Contribution of Inbound Logistics to Tech. development where out of 38 responses, 22 (57.9%) responded to Excellent, 12 (31.6%) responded to Good and 4 (10.5%) responded to Average.

HRM
38 responses



The above graph shows the Contribution of Inbound Logistics to Human Resource Management, where out of 38 responses, 14 (36.8%) responded to Excellent, 20 (52.6%) responded to Good and 4 (10.5%) responded to Average.

Firm Infrastructure.
38 responses

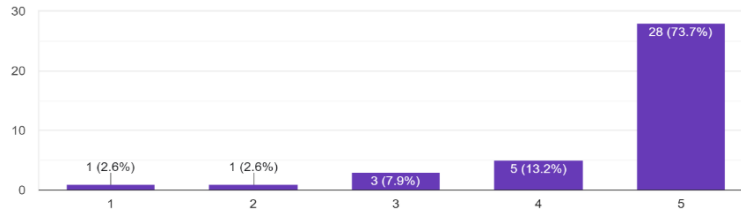


The above graph shows the Contribution of Inbound Logistics to Firm Infrastructure where out of 38 responses, 28 (73.7%) responded to Excellent, 4 (10.5%) responded to Good and 6 (15.8%) responded to Average.

It Shows the Contribution of Inbound Logistics to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.

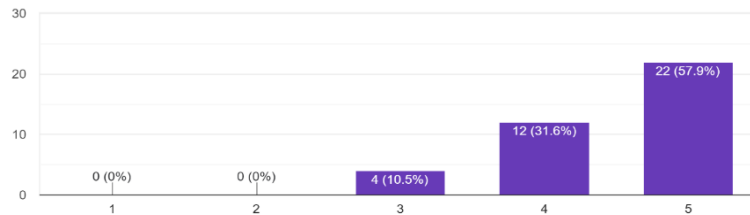
Operations

Procurement.
38 responses



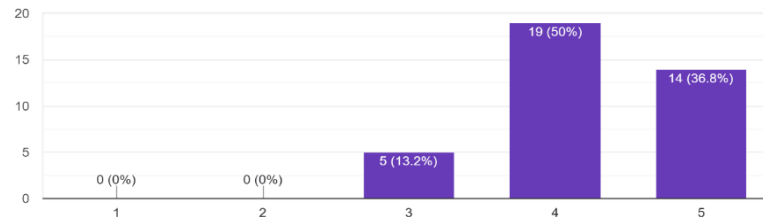
The above graph shows the Contribution of Operations to Procurement where out of 38 responses, 28 (73.7%) responded to Excellent, 5 (13.2%) responded to Good, 3 (7.9%) responded to Average, 1 (2.6%) responded to Bad and 1 (2.6%) responded to Poor.

Tech. development.
38 responses



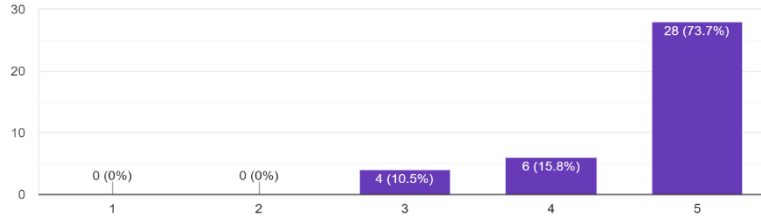
The above graph shows the Contribution of Operations to Tech development where out of 38 responses, 22 (57.9%) responded to Excellent, 12 (31.6%) responded to Good and 4 (10.5%) responded to Average.

HRM
38 responses



The above graph shows the Contribution of Operations to Human Resource Management where out of 38 responses, 14 (36.8%) responded to Excellent, 19 (50%) responded to Good and 4 (13.2%) responded to Average.

Firm Infrastructure.
38 responses

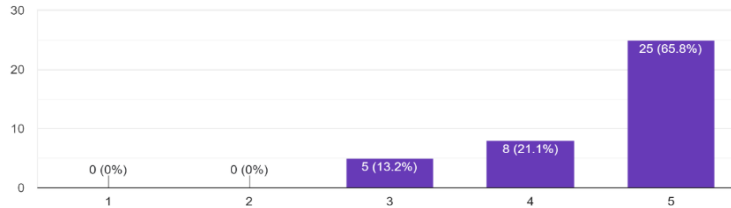


The above graph shows the Contribution of Operations to Firm Infrastructure where out of 38 responses, 28 (73.7%) responded to Excellent, 6 (15.8%) responded to Good and 4 (10.5%) responded to Average.

It Shows the Contribution of Operations to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.

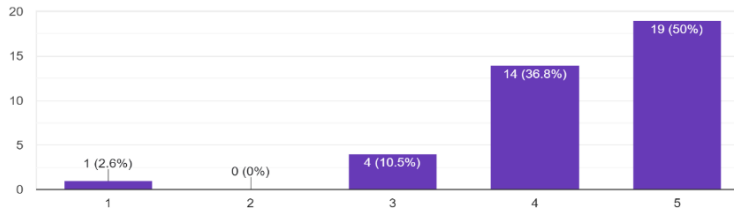
Outbound Logistics

Procurement.
38 responses



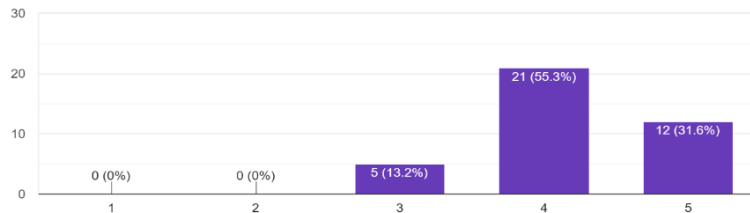
The above graph shows the Contribution of Outbound Logistics to Procurement where out of 38 responses, 25 (65.8%) responded to Excellent, 8 (21.1%) responded to Good and 5 (13.2%) responded to Average.

Tech. development.
38 responses



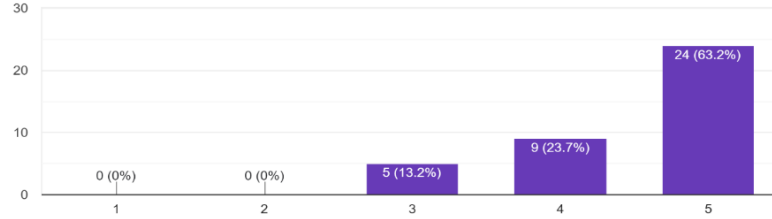
The above graph shows the Contribution of Outbound Logistics to Tech development where out of 38 responses, 19 (50%) responded to Excellent, 14 (36.8%) responded to Good, 4 (10.5%) responded to Average and 1 (2.6%) responded to Poor.

HRM
38 responses



The above graph shows the Contribution of Outbound Logistics to Procurement where out of 38 responses, 12 (31.6%) responded to Excellent, 21 (55.3%) responded to Good and 5 (13.2%) responded to Average.

Firm Infrastructure.
38 responses

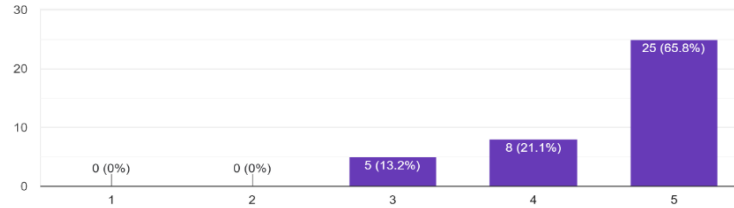


The above graph shows the Contribution of Outbound Logistics to Procurement where out of 38 responses, 24 (63.2%) responded to Excellent, 9 (23.7%) responded to Good and 5 (13.2%) responded to Average.

It Shows the Contribution of Outbound Logistics to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.

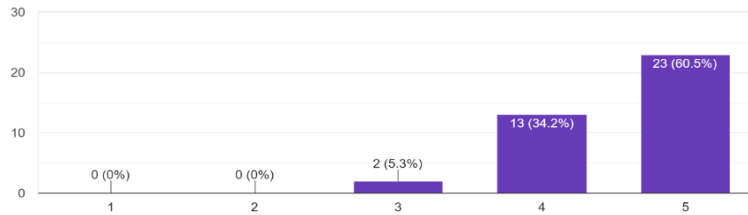
Marketing & Sales

Procurement.
38 responses



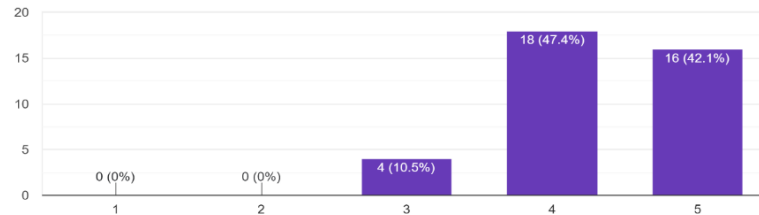
The above graph shows the Contribution of Marketing & Sales to Procurement where out of 38 responses, 25 (65.8%) responded to Excellent, 8 (21.1%) responded to Good and 5 (13.2%) responded to Average.

Tech. development.
38 responses



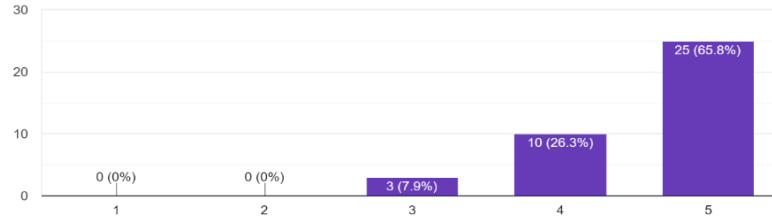
The above graph shows the Contribution of Marketing & Sales to Tech Development where out of 38 responses, 23 (60.5%) responded to Excellent, 13 (34.2%) responded to Good and 2 (5.3%) responded to Average.

HRM
38 responses



The above graph shows the Contribution of Marketing & Sales to Human Resource Management where out of 38 responses, 16 (42.1%) responded too Excellent, 18 (47.4%) responded to Good and 4 (10.5%) responded to Average.

Firm Infrastructure.
38 responses

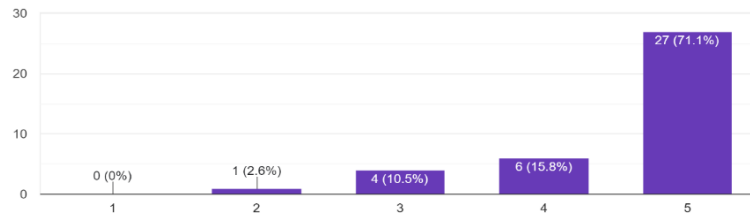


The above graph shows the Contribution of Marketing & Sales to Tech Development where out of 38 responses, 25 (65.8%) responded to Excellent, 10 (26.3%) responded to Good and 3 (7.9%) responded to Average.

It Shows the Contribution of Marketing And Sales to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.

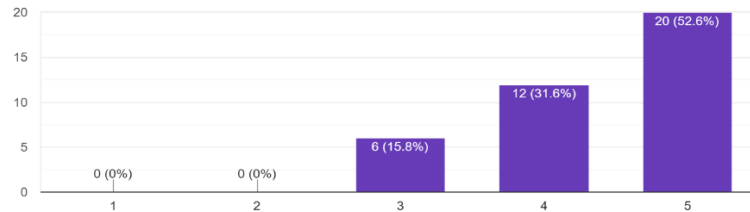
Services

Procurement.
38 responses



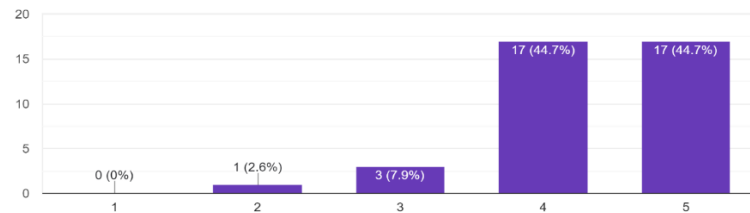
The above graph shows the Contribution of Services to Procurement where out of 38 responses, 27 (71.1%) responded to Excellent, 6 (15.8%) responded to Good, 4 (10.5%) responded to Average and 1 (2.6%) responded to Bad.

Tech. development.
38 responses

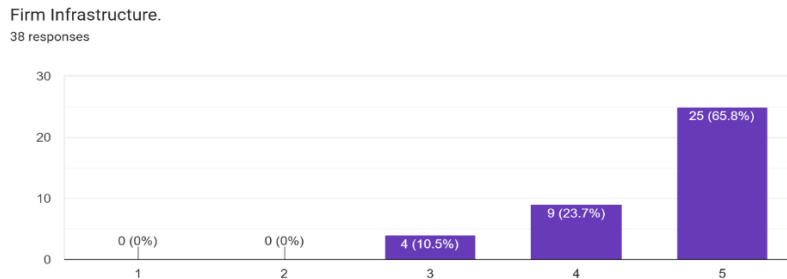


The above graph shows the Contribution of Services to Tech. development where out of 38 responses, 20 (52.6%) responded to Excellent, 12 (31.6%) responded to Good and 6 (15.8%) responded to Average.

HRM
38 responses



The above graph shows the Contribution of Services to Human Resource Management where out of 38 responses, 17 (44.7%) responded to Excellent, 17 (44.7%) responded to Good, 3 (7.9%) responded to Average and 1 (2.6%) responded to Bad.



The above graph shows the Contribution of Services to Firm infrastructure where out of 38 responses, 25 (65.8%) responded to Excellent, 9 (23.7%) responded to Good and 4 (10.5%) responded to Average.

It Shows the Contribution of Services to Procurement, Tech Development, Firm Infrastructure and Human Resource Management is Excellent.

Allocation of Support activities to Primary Activities

• **Procurement**

H01: There is no significant difference in allocation of Procurement to Inbound Logistics, Operations, Outbound Logistics, marketing & sales and Services.

HA1: There is significant difference in allocation of Procurement to Inbound Logistics, Operations, Outbound Logistics, marketing & sales and Services.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.284211	4	0.321053	0.4914	0.742056	2.420479
Within Groups	120.8684	185	0.653343			
Total	122.1526	189				

Since the p value is 0.742056266 which is greater than 0.05, H01 is accepted i.e. There is no significant difference in allocation of Procurement to primary activities.

• **Tech. Development**

H02: There is no significant difference in allocation of Tech Development to Inbound Logistics, operations, Outbound Logistics, marketing & sales and Services.

HA2: There is significant difference in allocation of Tech Development to Inbound Logistics, operations, Outbound Logistics, marketing & sales and Services.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.031579	4	0.507895	1.12919	0.34415	2.420479
Within Groups	83.21053	185	0.449787			
Total	85.24211	189				

Since the p value is 0.34415 which is greater than 0.05, H00 is accepted i.e. There is no significant difference in allocation of Tech Development to primary activities.

• **Human Resource Management**

H03: There is no significant difference in allocation of Human Resource Management to Inbound Logistics, operations, Outbound Logistics, marketing & sales and Services.

HA3: There is significant difference in allocation of Human Resource Management to Inbound Logistics, operations, Outbound Logistics, marketing & sales and Services.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.315789	4	0.328947	0.577115	0.67958	2.420479
Within Groups	105.4474	185	0.569986			
Total	106.7632	189				

Since the p value is 0.67958 which is greater than 0.05, H03 is accepted i.e. There is no significant difference in allocation of Human Resource Management to primary activities.

- **Firm Infrastructure**

H04: There is no significant difference in allocation of Firm Infrastructure to Inbound Logistics, operations, Outbound Logistics, marketing & sales and Services.

HA4: There is significant difference in allocation of Firm Infrastructure to Inbound Logistics, operations, Outbound Logistics, marketing & sales and Services.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.968421	4	0.242105	0.245954	0.911837	2.420479
Within Groups	182.1053	185	0.984353			
Total	183.0737	189				

Since the p value is 0.911837 which is greater than 0.05, H04 is accepted i.e. There is no significant difference in allocation of Firm Infrastructure to primary activities.

Summary: Allocation of Support activities to Primary activities

Particular	p Value	Remarks for null hypothesis
Procurement	0.742056266	Accepted
Tech Development	0.344149686	Accepted
Human Resource Management	0.67958023	Accepted
Firm Infrastructure	0.911837	Accepted

Since the p Values for Procurement, Tech Development, Human Resource Management and Firm Infrastructure are greater than 0.05, the Null Hypotheses are accepted.

Contribution of Support Activities with Reference to Primary Activities

- **Inbound Logistics**

H05: There is no significant difference in allocation of Inbound Logistics to Procurement, Tech development, HRM, Firm Infrastructure.

HA5: There is significant difference in allocation of Inbound Logistics to Procurement, Tech development, HRM, Firm Infrastructure.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.335526	3	0.778509	1.259227	0.290608	2.665729
Within Groups	91.5	148	0.618243			
Total	93.83553	151				

Since the p value is 0.290608 which is greater than 0.05, H05 is accepted i.e. There is no significant difference in allocation of Inbound Logistics to Support Activities.

Operations

H06: There is no significant difference in allocation of Operations to Procurement, Tech development, HRM, Firm Infrastructure.

HA6: There is significant difference in allocation of Operations to Procurement, Tech development, HRM, Firm Infrastructure.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3.177632	3	1.059211	1.851725	0.140337	2.665729
Within Groups	84.65789	148	0.572013			
Total	87.83553	151				

Since the p value is 0.140337 which is greater than 0.05, H06 is accepted i.e. There is no significant difference in allocation of Operations to Support Activities.

Outbound Logistics

H07: There is no significant difference in allocation of Outbound Logistics to Procurement, Tech development, HRM, Firm Infrastructure.

HA7: There is significant difference in allocation of Outbound Logistics to Procurement, Tech development, HRM, Firm Infrastructure.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.973684	3	0.991228	1.769735	0.155462	2.665729
Within Groups	82.89474	148	0.5601			
Total	85.86842	151				

Since the p value is 0.155462 which is greater than 0.05, H07 is accepted i.e. There is no significant difference in allocation of Outbound Logistics to Support Activities.

Marketing & Sales

H08: There is no significant difference in allocation of Marketing & sales to Procurement, Tech development, HRM, Firm Infrastructure.

HA8: There is significant difference in allocation of Marketing & Sales to Procurement, Tech development, HRM, Firm Infrastructure.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.651316	3	0.550439	1.266121	0.288214	2.665729
Within Groups	64.34211	148	0.434744			
Total	65.99342	151				

Since the p value is 0.288214 which is greater than 0.05, H08 is accepted i.e. There is no significant difference in allocation of Marketing & Sales to Support Activities.

Services

H09: There is no significant difference in allocation of Services to Procurement, Tech development, HRM, Firm Infrastructure.

HA9: There is significant difference in allocation of Services to Procurement, Tech development, HRM, Firm Infrastructure.

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.736842	3	0.578947	1.046945	0.373724	2.665729
Within Groups	81.84211	148	0.552987			
Total			83.57895			151

Since the p value is 0.373724 which is greater than 0.05, H09 is accepted i.e. There is no significant difference in allocation of Services to Support Activities.

Summary : Contribution of support activities with reference to primary activities.

Particular	p Value	Remarks for null Hypothesis
Inbound Logistics	0.290608	Accepted
Operations	0.140337	Accepted
Outbound Logistics	0.155462	Accepted
Marketing & Sales	0.288214	Accepted
Services	0.373724	Accepted

Since the p Values for Inbound Logistics, Operations, Outbound Logistics, Marketing & Sales and Services are greater than 0.05, the Null Hypotheses are accepted.

Findings

- The majority of the companies (71%) have excellent understanding of the current cost structure of the company followed by Good understanding (16%).

- 50% of the companies have rated their resource allocation to support companies operations as an Excellent. Where as 37%, have rated as good.
- Allocation of each support activity to primary activities is not different significantly respectively.
- The Contribution of Inbound Logistics to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.
- The Contribution of Operations to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.
- The Contribution of Outbound Logistics to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.
- The Contribution of Marketing and Sales to Procurement, Tech Development and Firm Infrastructure is Excellent where as in Human Resource Management its Good.
- The Contribution of Services to Procurement, Tech Development, Firm Infrastructure and Human Resource Management is Excellent.

Conclusion

- **Understanding of Cost Structure:** The majority of companies demonstrate a strong understanding of their cost structures, which is crucial for effective management and decision-making.
- **Resource Allocation:** A significant portion of companies rate their resource allocation for supporting operations with 50% rating it as excellent and 37% as good, indicating a perceived alignment between resource allocation and operational needs.
- **Contribution of Activities:** In general, activities across the value chain, including inbound logistics, operations, outbound logistics, marketing and sales, services, and human resource management, are perceived to make significant contributions to various aspects such as procurement, tech development, and firm infrastructure. However, there might be room for improvement in HR management's contribution compared to other activities.
- **Assessment on Existing Value Chain:** Companies have an excellent assessment of their existing value chain, indicating a strong understanding of their operations.

Overall, the majority of companies appear to be performing well across various aspects of their value chain and customer satisfaction. However, there are areas such as human resource management contribution, customer effort, and clarity for buying products that may warrant further attention and improvement efforts to enhance overall competitiveness and customer experience.

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