

Republic of Trinidad and Tobago

2009

SURVEY OF
INNOVATION IN
THE CHEMICAL
AND NON-
METALLIC
PRODUCTS
INDUSTRY



NIHERST

NATIONAL INSTITUTE
OF HIGHER EDUCATION
RESEARCH SCIENCE AND TECHNOLOGY

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Introduction

Innovation surveys have been undertaken in excess of fifty developed and developing countries. An innovation survey of the food and beverage industry in Trinidad and Tobago was conducted by NIHERST in 2006. The results of a similar study of the chemicals and non-metallic products industry undertaken in 2008 are presented in this report.

Innovation surveys are carried out to achieve four goals:

- To measure inputs and outputs of the innovation process across a wide range of establishments and industries
- To acquire an overview of the innovative behaviour of establishments and enterprises
- To develop policy and support analysis in the area of innovation
- To benchmark innovation performance against some best practice standards of reference that would either be an establishment, industry, country or region.

Methodology

Objectives of the Survey

The objective of the survey was to obtain information with respect to the innovative activities of establishments in the chemicals and non-metallic minerals industry including:

- The types of innovative activities undertaken and the reasons for undertaking such activities
- The obstacles/hindrances to innovative activities
- The impact of innovation on key performance indicators
- The role of linkages for the acquisition of information and collaboration leading to innovation
- The role of research and development in the innovation process.

The results of the survey will be utilised to provide insights into the innovation process and to assist decision-makers in developing policies to create the environment and incentives to catalyse innovation in the industry.

Coverage

The frame of establishments in the chemical and non-metallic products industry in Trinidad and Tobago was obtained from the Central Statistical Office (CSO) and comprised eighty-nine (89) establishments. A sample of the establishments in the sub-sectors was chosen from the CSO listing.

The survey was administered to fifty-seven (57) establishments across a range of seven (7) sub-sectors. The sub-sectors surveyed were as follows:

- Industrial gases
- Paints, varnishes, lacquers and allied products
- Cosmetics, soaps, toilet preparations and pharmaceutical products
- Glass, glass products and plastic products
- Bricks and blocks
- Readymix, and other concrete products and cement
- Petrochemicals

The survey was carried out by field officers during the period August – November, 2008 and elicited participation from 26 establishments for a response rate of 45.6%.

Establishment Profiles

The questionnaire sought to elicit a profile of the establishments surveyed. Elements of the profile included:

- Age
- Ownership structure
- Main activity (classification by sub-sector)
- Employment (including number of scientists and engineers)
- Sales
- Exports
- Licensing arrangements
- Sub-contracting arrangements
- Purchases of new machinery

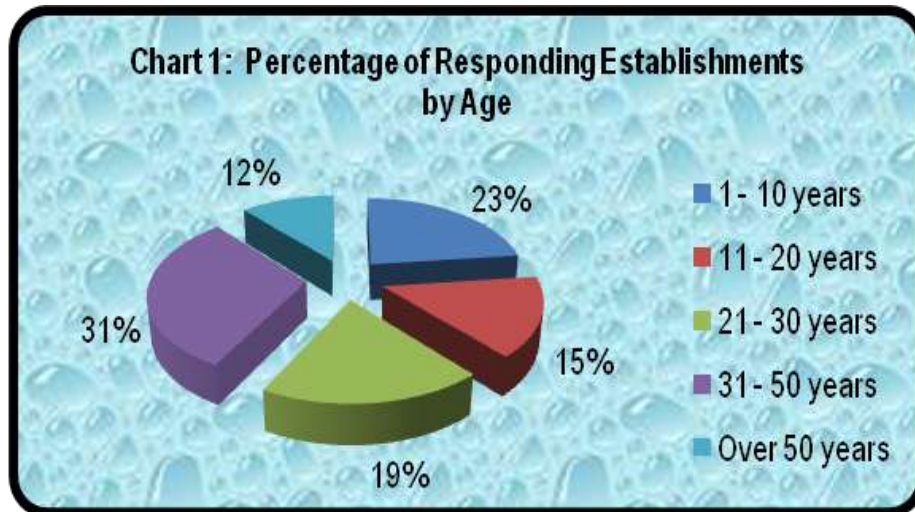
Analysis of Survey Results

Age

Six establishments (23%) were 10 years old and under with four establishments (15%) between 11-20 years old. Cumulatively, 58% of the establishments were 30 years old and under, while eight establishments (31%) were 31-50 years old. At the other end of the spectrum three establishments (12%) were over 50 years old (Table 1).

Table 1: Age of Establishments

Age	No.	Percent	Cumulative percent
1 - 10 years	6	23.1	23.1
11 - 20 years	4	15.4	38.5
21 - 30 years	5	19.2	57.7
31 - 50 years	8	30.8	88.5
Over 50 years	3	11.5	100
Total	26	100	

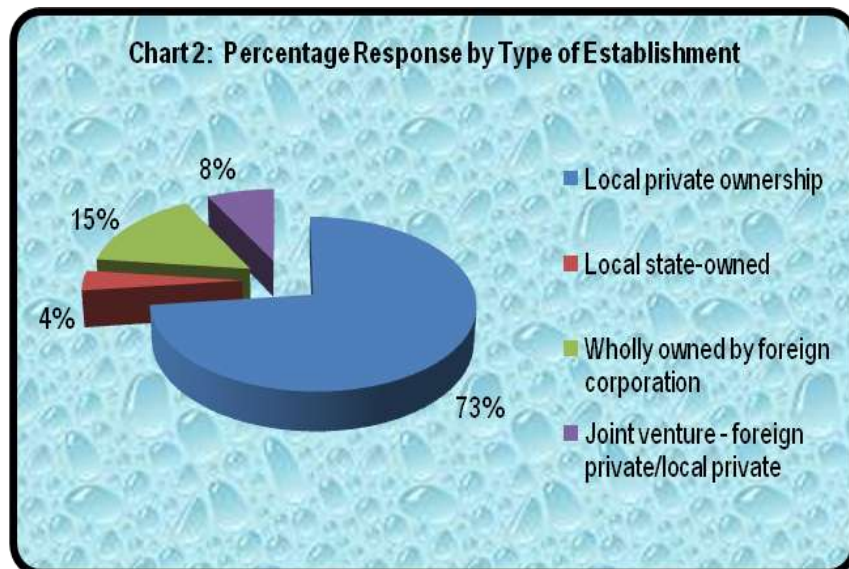


Ownership Structure

The majority of establishments surveyed, 19 or 73%, were local and privately owned. Four establishments (15%) were wholly owned by foreign corporations while two establishments (8%) were foreign private/local private joint venture arrangements (Table 2).

Table 2: No. of Establishments by Type of Ownership

Ownership structure	No.	Percent	Cumulative percent
Local private ownership	19	73.1	73.1
Local state-owned	1	3.8	76.9
Wholly owned by foreign corporation	4	15.4	92.3
Joint venture - foreign private/local private	2	7.7	100.0
Total	26	100.0	



Main Activity

The activities of the establishments were distributed over seven sub-sectors (Table 3). The sub-sectors represented were:

- Industrial gases - 2 establishments (8%)
- Paints, varnishes, lacquers and allied products – 2 establishments (8%)
- Cosmetics, soaps, toilet preparations and pharmaceutical products – 5 establishments (19%)
- Glass, glass products and plastic products – 2 establishments (8%)
- Bricks and blocks – 3 establishments (11%)
- Readymix and other concrete products and cement – 8 establishments (31%)
- Petrochemicals – 4 establishments (15%)

Table 3: No. of Establishments by Sub-sector

Sub-sector	No. and percentage of establishments		
	No.	Percent	Cumulative percent
Industrial gases	2	7.7	7.7
Paints, varnishes, lacquers and allied products	2	7.7	15.4
Cosmetics, soap, toilet preparation and pharmaceuticals	5	19.2	34.6
Glass, glass products and plastic products	2	7.7	42.3
Bricks and blocks	3	11.5	53.8
Readymix, other concrete products and cement	8	30.8	84.6
Petrochemicals	4	15.4	100.0
Total	26	100.0	

Employment

Thirteen establishments representing 50% of the responding sample employed less than 50 persons. Of these, four establishments (15%) employed less than 10 persons. Ten establishments (38%) employed between 50-249 employees, while three establishments (12%) employed 250 persons and over (Table 4).

Table 4: No. of Establishments by Employment

Employment Group	No.	Percent	Cumulative Percent
< 10 employees	4	15.4	15.4
10 - 49 employees	9	34.6	50
50 - 249 employees	10	38.5	88.5
250 and over employees	3	11.5	100.0
Total	26	100.0	

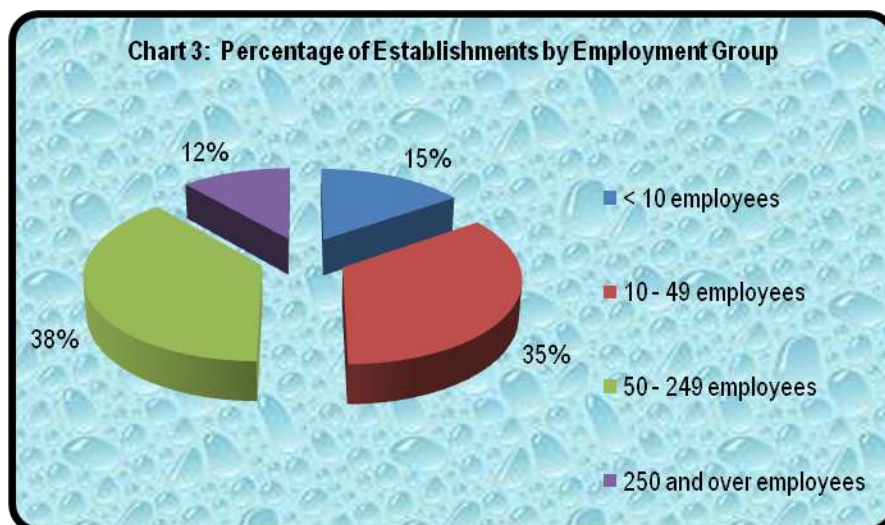


Table 5: No. of Establishments with Change in Employment, 2006-2007

Employment	No. and percentage of establishments		
	No.	Percent	Cumulative percent
Increased	14	53.8	53.8
Decreased	2	7.7	61.5
Stayed the same	10	38.5	100.0
Total	26	100.0	

The majority of establishments (54%) (Table 5) especially amongst those with 50 – 249 employees (80%) (Table 6) reported growth in employment between 2006-2007. Ten establishments (39%) reported no change in employment.

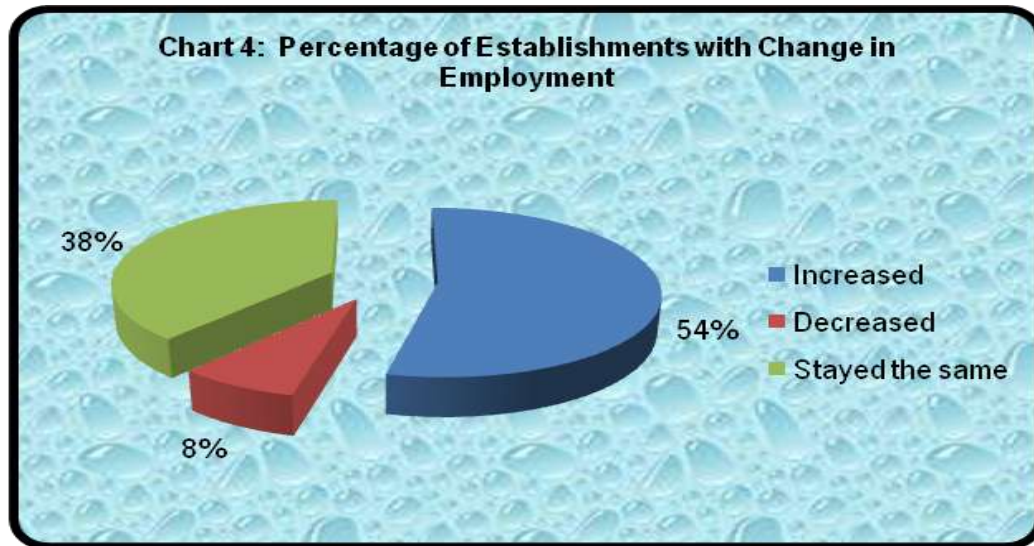


Table 6: Change in Employment, 2006 – 2007

Employment Group	Change in employment, 2006-2007							
	Increased		Decreased		Stayed the same		Total	
	No.	%	No.	%	No.	%	No.	%
< 10 employees	2	50.0	0	0.0	2	50.0	4	100.0
10 - 49 employees	4	44.4	1	11.1	4	44.4	9	100.0
50 - 249 employees	8	80.0	0	0.0	2	20.0	10	100.0
250 and over employees	0	0.0	1	33.3	2	66.7	3	100.0
Total	14	53.8	2	7.7	10	38.5	26	100.0

Scientists and Engineers

Six (23%) of the responding establishments employed no scientists and engineers, thirteen (50%) employed between 1-3 scientists and engineers and four (15%) employed between 6-14. Two establishments employed 26 and 40 engineers and scientists, respectively (Table 7).

Table 7: No. of Scientists and Engineers by Establishments

No. of scientists and engineers	No. and percentage of establishments		
	No.	Percent	Cumulative percent
0	6	23.1	23.1
1	5	19.2	42.3
2	4	15.4	57.7
3	4	15.4	73.1
6	1	3.8	76.9
8	1	3.8	80.8
12	1	3.8	84.6
14	1	3.8	88.5
26	1	3.8	92.3
40	1	3.8	96.2
Not stated	1	3.8	100.0
Total	26	100.0	

Sales

Six establishments (23%) reported sales of \$10m and less, while eight establishments (31%) reported sales of between \$16-50 m in 2007. Three establishments (11%) reported sales of between \$51-100m, while 6 establishments (23%) indicated that sales were in excess of \$100m. Three establishments (12%) did not respond.

Table 8: No. of Establishments by Sales, 2007

Sales	No. and percentage of establishments		
	No.	Percent	Cumulative percent
Less than \$1m	1	3.8	3.8
\$1 - 5m	3	11.5	15.4
\$6 - 10m	2	7.7	23.1
\$16 - 20m	3	11.5	34.6
\$21 - 50m	5	19.2	53.8
\$51 - 100m	3	11.5	65.4
More than \$100m	6	23.1	88.5
Not stated	3	11.5	100.0
Total	26	100.0	

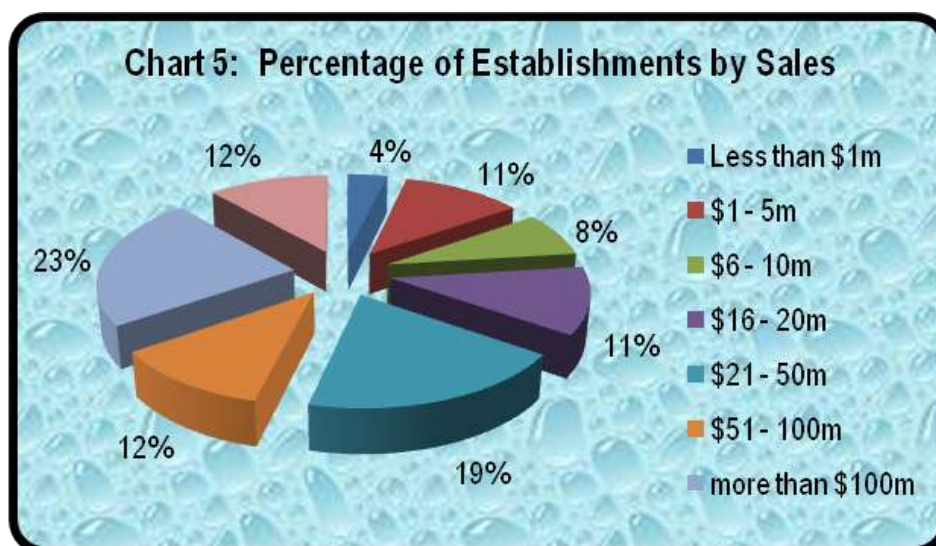
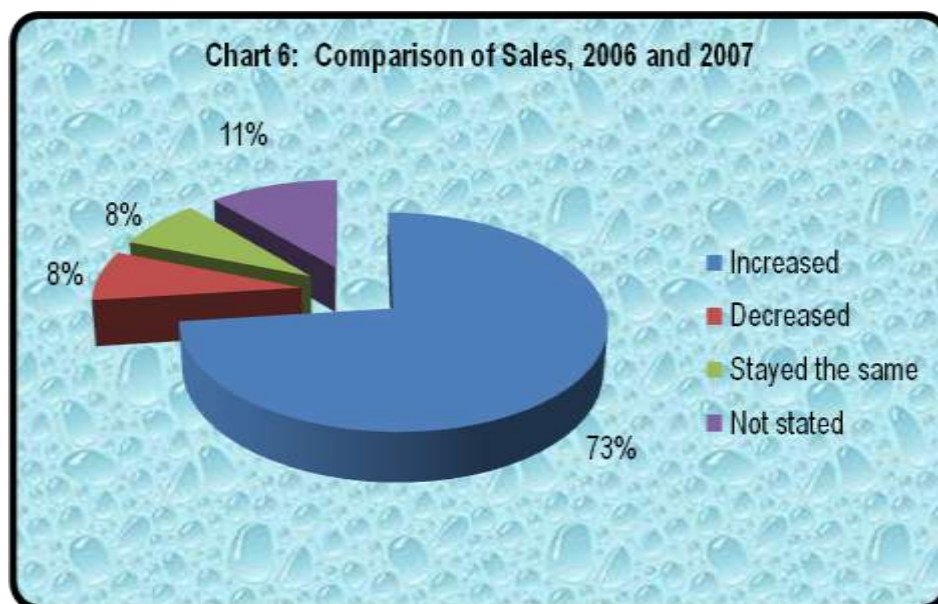


Table 9: Comparison of Sales, 2006 and 2007

Sales 2006-2007	No. and percentage of establishments		
	No.	Percent	Cumulative percent
Increased	19	73.1	73.1
Decreased	2	7.7	80.8
Stayed the same	2	7.7	88.5
Not stated	3	11.5	100.0
Total	26	100.0	

Seventy-three percent (73%) of the establishments reported increases in sales between 2006-2007, while 8% in each case indicated decreases and no change in sales (Table 9).



Exports

Four establishments (15%) exported less than \$1m, while six establishments (23%) exported between \$1-10m in 2007. Two establishments (8%) exported between \$21-50m, while five establishments (19%) reported export sales in excess of \$100m. Seven establishments (27%) indicated that they did not export (Table 10).

Table 10: Export Sales, 2007

Export sales 2007	No. and percentage of establishments		
	No.	Percent	Cumulative percent
Less than \$1m	4	15.4	15.4
\$1 - 5m	3	11.5	26.9
\$6 - 10m	3	11.5	38.5
\$21 - 50m	2	7.7	46.2
More than \$100m	5	19.2	65.4
Do not export	7	26.9	92.3
Not stated	2	7.7	100.0
Total	26	100.0	

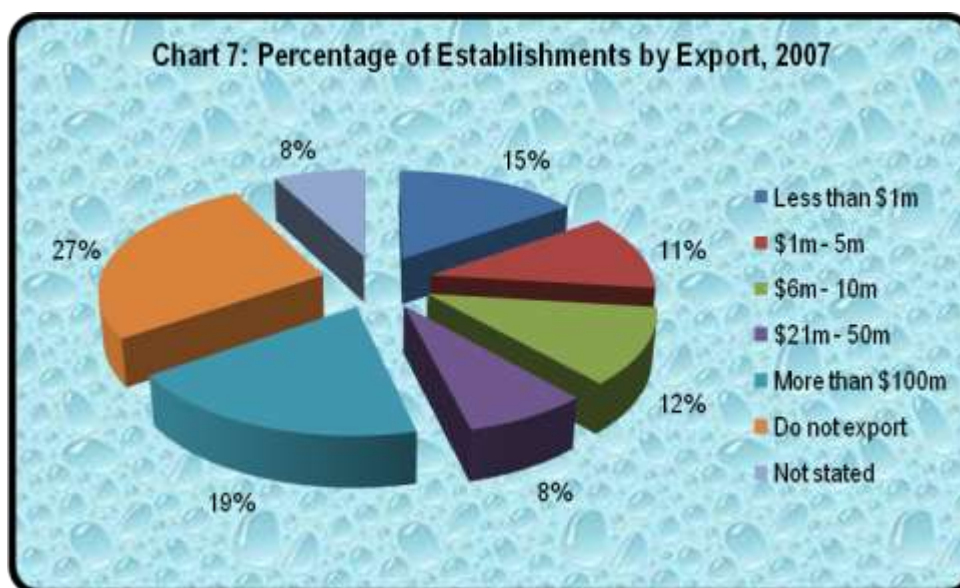
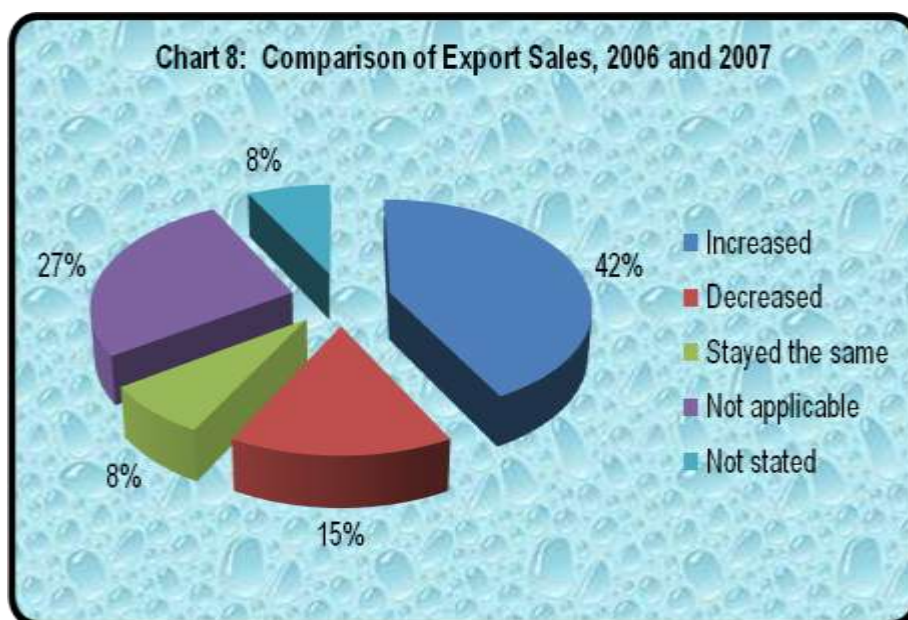


Table 11: Comparison of Export Sales, 2006 and 2007

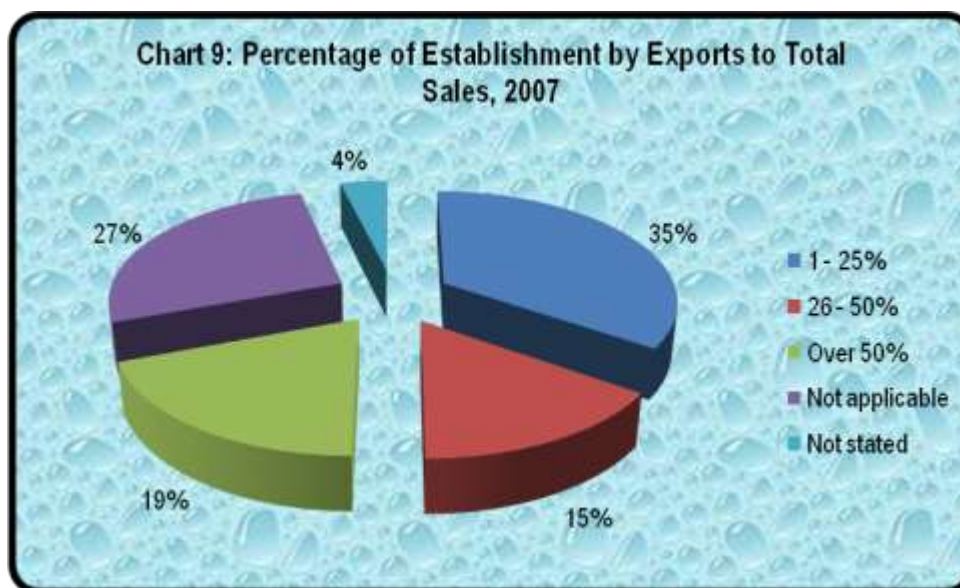
Exports 2006-2007	No. and percentage of establishments		
	No.	Percent	Cumulative percent
Increased	11	42.3	42.3
Decreased	4	15.4	57.7
Stayed the same	2	7.7	65.4
Not applicable	7	26.9	92.3
Not stated	2	7.7	100.0
Total	26	100.0	



Eleven establishments (42%) reported increases in export sales in 2007 compared with 2006, while four (15%) recorded decreases and two (8%) indicated that sales remained the same (Table 11).

Table 12: Exports to Total Sales, 2007

<u>Exports</u> Total sales %	No. and percentage of establishments		
	No.	Percent	Cumulative percent
1 - 25%	9	34.6	34.6
26 - 50%	4	15.4	50.0
Over 50%	5	19.2	69.2
Not applicable	7	26.9	96.2
Not stated	1	3.8	100.0
Total	26	100.0	



Exports represented 25% or less of total sales for nine (35%) of the responding establishments and between 26-50% of sales for four (15%) establishments. Five (19%) establishments indicated that their exports to sales ratio was in excess of 50% in 2007 (Table 12).

Licensing Arrangements

The majority of establishments (77%) had no licensing contract for product or process technology, thus nullifying this form of technology transfer for these establishments. However, five establishments (19%) reported that they had entered into such contracts (Table 13).

Table 13: Licensing Contract for Product or Process Technology

Licensing contract	No. and percentage of establishments	
	No.	Percent
Yes	5	19.2
No	20	76.9
Not stated	1	3.8
Total	26	100.0

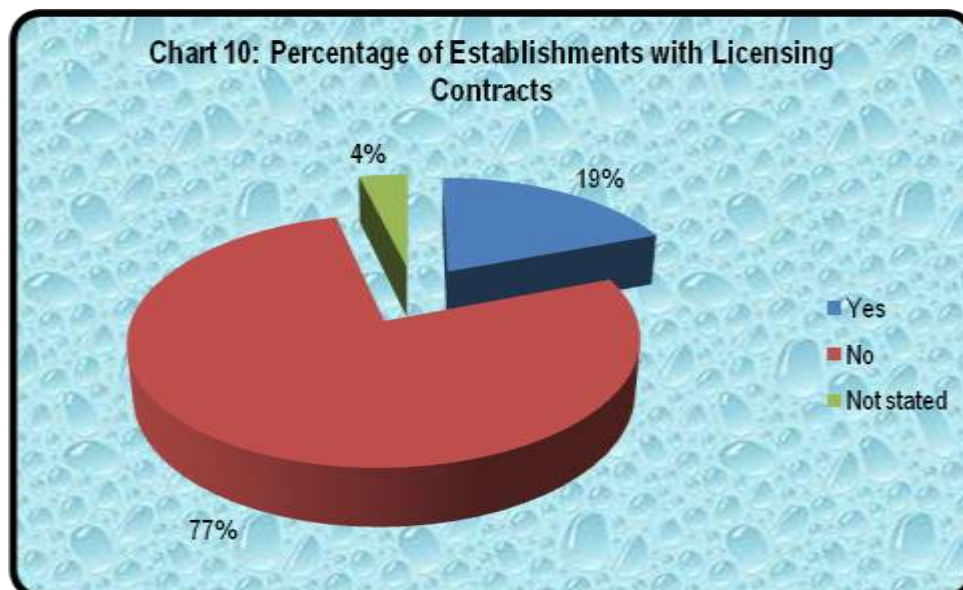


Table 14: Licensing Contract by Sub-sector

Sub-sector	No. of establishment with licensing contract			
	Yes	No	Not stated	Total
Industrial gases	0	2	0	2
Paints, varnishes, lacquers and allied products	1	1	0	2
Cosmetics, soap, toilet preparation and pharmaceuticals	1	4	0	5
Glass, glass products and plastic products	0	2	0	2
Bricks and blocks	0	3	0	3
Readymix, other concrete products and cement	1	6	1	8
Petrochemicals	2	2		4
Total	5	20	1	26

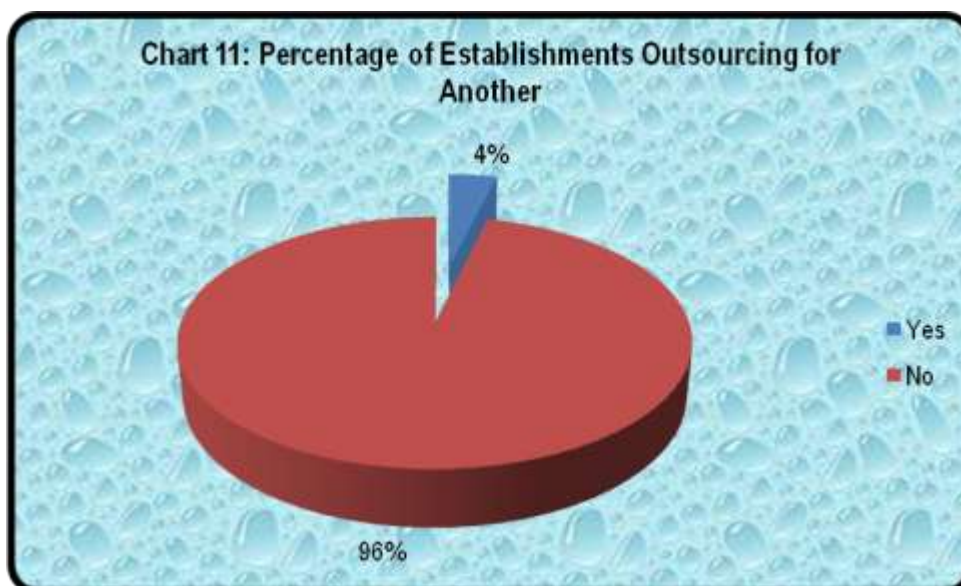
The five establishments that had licensing agreements were in the following sub-sectors: paints, varnishes, lacquers and allied products; cosmetics, soap, toilet preparation and pharmaceuticals; readymix, other concrete products and cement and petrochemicals (Table14).

Outsourcing

The vast majority of establishments (96%) indicated that they were not outsourcing for another establishment, thereby eliminating this arrangement as a possible source for diffusing innovative activity (Table 15).

Table 15: Outsourcing for Another Establishment

Outsourcing	No. of establishments	Percent
Yes	1	3.8
No	25	96.2
Total	26	100.0



Purchase of Equipment

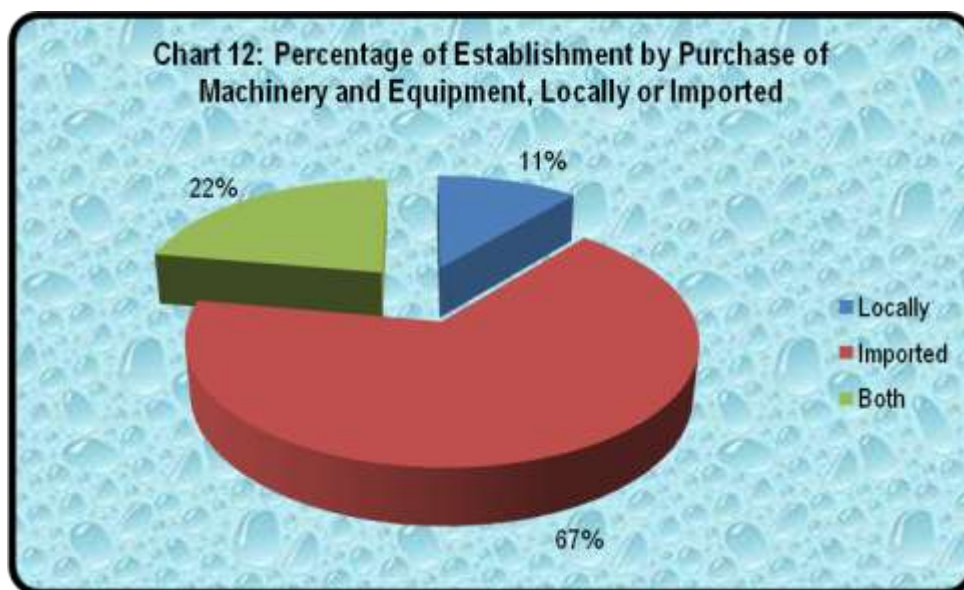
Eighteen establishments (69%) reported that they had purchased new equipment during 2006-2007, of which twelve (67%) stated that the equipment had been imported (Tables 16 and 17).

Table 16: Purchase of New Machinery and Equipment, 2006-2007

Purchase	No. and percentage of establishments	
	No.	Percent
Yes	18	69.2
No	8	30.8
Total	26	100.0

Table 17: Purchase of New Machinery and Equipment, Locally or Imported

Purchase	No. and percentage of establishments		
	No.	Percent	Cumulative percentage
Locally	2	11.1	11.1
Imported	12	66.7	77.8
Both	4	22.2	100.0
Total	18	100.0	



Seventy-two percent (72%) of the establishments which purchased new machinery and equipment indicated that sales had increased in 2006-2007. A similar percentage (75%) of establishments which did not purchase machinery and equipment during this period also reported increased sales (Table 18).

Table 18: Purchase of New Machinery and Equipment by Comparison of Sales, 2006 and 2007

Purchase new machinery and equipment	Comparison of sales, 2006-2007									
	Increased		Decreased		Stayed the same		Not stated		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Yes	13	72.2	1	5.6	1	5.6	3	16.7	18	100.0
No	6	75.0	1	12.5	1	12.5	0	0.0	8	100.0
Total	19	73.1	2	7.7	2	7.7	3	11.5	26	100.0

Innovation Activities

Innovation activities were evaluated under four main categories as follows:

- Product
- Process
- Organisational
- Marketing

Product Innovation

Product innovation was analysed under three headings as follows:

- Introduced a new product
- Improved an existing product
- Developed a new product

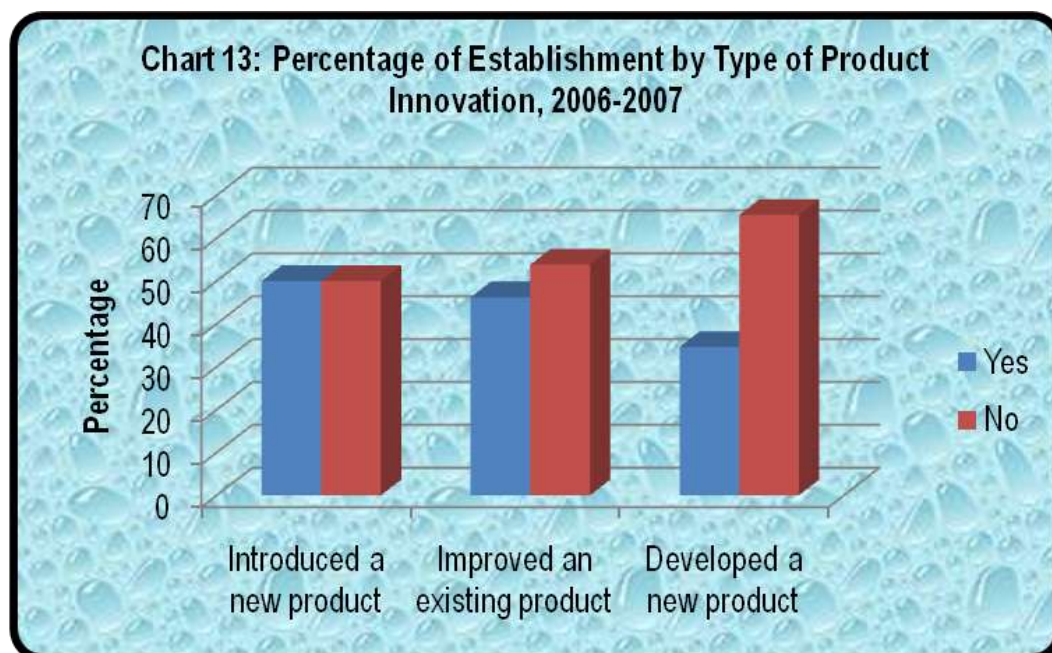
A new product was defined in the questionnaire as “a product which is new to your firm whose characteristics or intended uses differ significantly from those of your firm’s previously produced products.” A significantly improved product was defined as “an existing product whose performance has been significantly enhanced or upgraded.”

Introduced a New Product

Of the establishments that responded to the survey, thirteen (50%) indicated that they had introduced a new product, while twelve (46%) had improved an existing product and nine (35%) developed a new product during 2006-2007 (Table19).

Table 19: No. and Percentage of Establishments by Type of Product Innovation, 2006-2007

Type of product innovation	No. and percentage of establishments					
	Yes		No		Total	
	No.	%	No.	%	No.	%
Introduced a new product	13	50.0	13	50.0	26	100.0
Improved an existing product	12	46.2	14	53.8	26	100.0
Developed a new product	9	34.6	17	65.4	26	100.0



Eighty-five percent (85%) of the establishments that introduced a new product stated that sales increased between 2006 and 2007 (Table 20).

Table 20: Percentage of Establishments that Introduced a New Product by the Comparison of Sales, 2006-2007

Introduced a new product	Comparison of sales, 2006-2007				Total
	Increased	Decreased	Stayed the same	Not stated	
Yes	84.6	0.0	15.4	0.0	100.0
No	61.5	15.4	0.0	23.1	100.0
Total	73.1	7.7	7.7	11.5	100.0

Product innovation was more prevalent amongst older establishments. Eighty-eight percent (88%) of establishments in the 31-50 age group and sixty-seven percent (67%) over 50 years introduced new products, compared with seventeen percent (17%) of establishments in the 1-10 years age category, and fifty percent (50%) of those in existence for 11-20 years (Tables 21a and 21b). Product innovation was observed across all the sub-sectors with the exception of industrial gases (Table 22a).

Table 21a: No. of Establishments that Introduced a New Product by Age

Age of establishment	Introduced a new product		Total
	Yes	No	
1 - 10 years	1	5	6
11 - 20 years	2	2	4
21 - 30 years	1	4	5
31 - 50 years	7	1	8
Over 50 years	2	1	3
Total	13	13	26

Table 21b: Percentage of Establishments that Introduced a New Product by Age

Age of establishment	Introduced a new product		Total
	Yes	No	
1 - 10 years	16.7	83.3	100.0
11 - 20 years	50.0	50.0	100.0
21 - 30 years	20.0	80.0	100.0
31 - 50 years	87.5	12.5	100.0
Over 50 years	66.7	33.3	100.0
Total	50.0	50.0	100.0

Table 22a: No. of Establishments that Introduced a New Product by Sub-sector

Sub-sector	Introduced a new product		Total
	Yes	No	
Industrial gases	0	2	2
Paints, varnishes, lacquers and allied products	2	0	2
Cosmetics, soap, toilet preparation and pharmaceuticals	3	2	5
Glass, glass products and plastic products	2	0	2
Bricks and blocks	2	1	3
Readymix, other concrete products and cement	3	5	8
Petrochemicals	1	3	4
Total	13	13	26

Table 22b: Percentage of Establishments that Introduced a New Product by Sub-sector

Sub-sector	Introduced a new product		Total
	Yes	No	
Industrial gases	0.0	100.0	100.0
Paints, varnishes, lacquers and allied products	100.0	0.0	100.0
Cosmetics, soap, toilet preparation and pharmaceuticals	60.0	40.0	100.0
Glass, glass products and plastic products	100.0	0.0	100.0
Bricks and blocks	66.7	33.3	100.0
Readymix, other concrete products and cement	37.5	62.5	100.0
Petrochemicals	25.0	75.0	100.0
Total	50.0	50.0	100.0

In terms of employment characteristics, establishments with 50 employees and more showed the highest incidence of product innovation (Table 23).

Table 23: No. and Percentage of Establishments that Introduced a New Product by Employment

Employment	Introduced a new product					
	Yes		No		Total	
	No.	%	No.	%	No.	%
< 10 employees	2	50.0	2	50.0	4	100.0
10 - 49 employees	3	33.3	6	66.7	9	100.0
50 - 249 employees	6	60.0	4	40.0	10	100.0
250 and over employees	2	66.7	1	33.3	3	100.0
Total	13	50.0	13	50.0	26	100.0

New product introductions were reported in all sales categories, with the exception of establishments with sales under \$1m (Table 24). New products were introduced by eleven exporting establishments compared with two (2) non-exporting establishments in 2007 (Table 25).

Table 24: No. and Percentage of Establishments that Introduced a New Product by Sales 2007

Sales	Introduced a new product					
	Yes		No		Total	
	No.	%	No.	%	No.	%
Less than \$1m	0	0.0	1	100.0	1	100.0
\$1 - 5m	2	66.7	1	33.3	3	100.0
\$6 - 10m	2	100.0	0	0.0	2	100.0
\$16 - 20m	1	33.3	2	66.7	3	100.0
\$21 - 50m	3	60.0	2	40.0	5	100.0
\$51 - 100m	2	66.7	1	33.3	3	100.0
More than \$100m	3	50.0	3	50.0	6	100.0
Not stated	0	0.0	3	100.0	3	100.0
Total	13	50.0	13	50.0	26	100.0

**Table 25: No. of Establishments that Introduced a New Product by Exports
2007**

Export	Introduced a new product – Nos.		
	Yes	No	Total
Less than \$1m	2	2	4
\$1 - 5m	3	0	3
\$6 - 10m	2	1	3
\$21 - 50m	2	0	2
More than \$100m	2	3	5
Not applicable	2	5	7
Not stated	0	2	2
Total	13	13	26

Improved an Existing Product

Twelve establishments (46%) indicated that they had improved an existing product, while fourteen establishments (54%) had not (Table 19).

Fifty-three percent (53%) of the establishments that reported increased sales in 2006-2007 had improved an existing product, while forty-seven percent (47%) had not but also indicated that sales had increased (Table 26).

Table 26: Comparison of Sales, 2006-2007 by Improving an Existing Product

Sales, 2006-2007	Improved an existing product - %		Total
	Yes	No	
Increased	52.6	47.4	100.0
Decreased	50.0	50.0	100.0
Stayed the same	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	46.2	53.8	100.0

All establishments, with the exception of those with sales of under \$1m and between \$6-10m, reported product improvements (Table 27).

Table 27: Sales in 2007 by Improving an Existing Product

Sales, 2007	Improved an existing product - %		Total
	Yes	No	
Less than \$1m	0.0	100.0	100.0
\$1 - 5m	66.7	33.3	100.0
\$6 - 10m	0.0	100.0	100.0
\$16 - 20m	33.3	66.7	100.0
\$21 - 50m	60.0	40.0	100.0
\$51 - 100m	100.0	0.0	100.0
More than \$100m	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	46.2	53.8	100.0

Developed a New Product

Nine establishments (35%) reported that they had developed a new product while 17 (65%) revealed that they had not done so (Table 19).

Of the establishments that reported increased sales in the 2006-2007 period forty-two percent (42%) indicated that they had developed a new product, while fifty-eight percent (58%) had not. However, fifty percent (50%) of the establishments that reported no changes in sales also indicated that they had developed a new product (Table 28).

Table 28: Comparison of Sales, 2006-2007 by Developing a New Product

Sales, 2006-2007	Developed a new product - %		Total
	Yes	No	
Increased	42.1	57.9	100.0
Decreased	0.0	100.0	100.0
Stayed the same	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	34.6	65.4	100.0

The establishment profiles including (sub-sector, age, employment and sales) exhibited somewhat similar characteristics as reported for new product innovation and improvement of existing products.

Process Innovation

Process innovation encompassed the following:

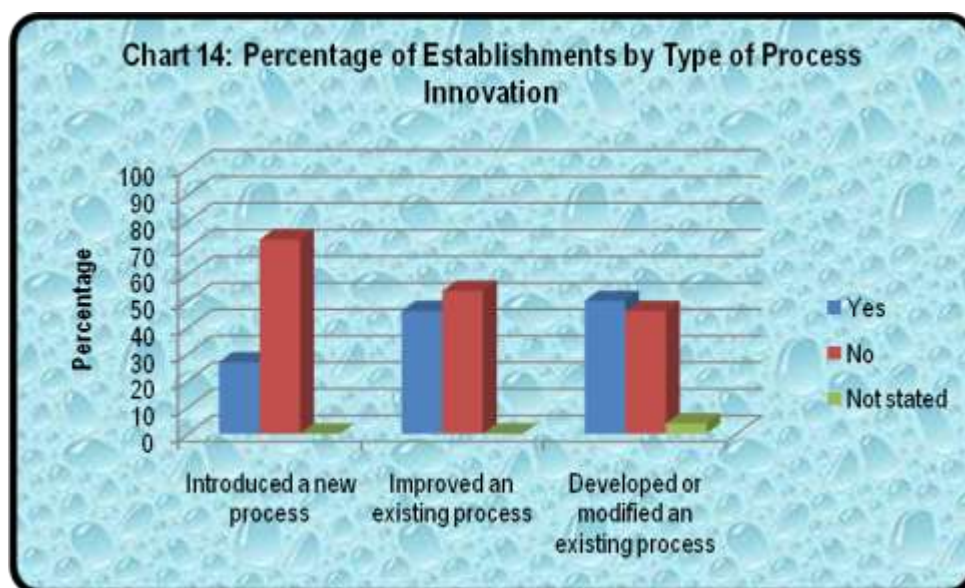
- Introduced a new process
- Improved an existing process
- Developed or modified an existing process

New production/manufacturing/delivery processes were defined in the questionnaire as “processes which are new to your establishment. *This involves the introduction into your establishment of new manufacturing/delivery methods, procedures, systems, machinery or equipment which differs significantly from your firm’s previous production/manufacturing/delivery processes.*”

Significantly improved production/manufacturing/delivery processes involve “*significant changes to your existing processes which result in changes in the level of output, quality of products and costs of production or distribution.*”

Table 29: No. and Percentage of Establishments by Type of Process Innovation

Type of process innovation	No. and percentage of establishments							
	Yes		No		Not stated		Total	
	No.	%	No.	%	No.	%	No.	%
Introduced a new process	7	26.9	19	73.1	0	0.0	26	100.0
Improved an existing process	12	46.2	14	53.8	0	0.0	26	100.0
Developed or modified an existing process	13	50.0	12	46.2	1	3.8	26	100.0



Introduced a new process

Seven establishments (27%) had introduced a new process, while 19 establishments (73%) had not been engaged in that type of activity (Table 29).

However, only one quarter (26%) of the establishments that reported an increase in sales between 2006 and 2007 had introduced a new process (Table 30).

Table 30: Comparison of Sales, 2006-2007 by Introducing a New Process

Sales, 2006-2007	Introduced a new process - %		Total
	Yes	No	
Increased	26.3	73.7	100.0
Decreased	0.0	100.0	100.0
Stayed the same	100.0	0.0	100.0
Not stated	0.0	100.0	100.0
Total	26.9	73.1	100.0

Establishments with sales of \$21-50m in 2007 reported the highest incidence of process innovation (Table 31).

Table 31: No. and Percentage of Establishments that Introduced a New Process by Sales, 2007

Sales	Introduced a new process					
	Yes		No		Total	
	No.	%	No.	%	No.	%
Less than \$1m	0	0.0	1	5.3	1	3.8
\$1 - 5m	0	0.0	3	15.8	3	11.5
\$6 - 10m	1	14.3	1	5.3	2	7.7
\$16 - 20m	1	14.3	2	10.5	3	11.5
\$21 - 50m	3	42.9	2	10.5	5	19.2
\$51 - 100m	0	0.0	3	15.8	3	11.5
More than \$100m	2	28.6	4	21.1	6	23.1
Not stated	0	0.0	3	15.8	3	11.5
Total	7	100.0	19	100.0	26	100.0

In terms of age profile, establishments between 31-50 years had been more active in process innovation than younger establishments (Table 32). With respect to sub-sector activity, new process innovation was observed throughout with the exception of industrial gases (Table 33).

Table 32: No. and Percentage of Establishments that Introduced a New Process by Age

Age of establishment	Introduced a new process					
	Yes		No		Total	
	No.	%	No.	%	No.	%
1 - 10 years	1	14.3	5	26.3	6	23.1
11 - 20 years	1	14.3	3	15.8	4	15.4
21 - 30 years	1	14.3	4	21.1	5	19.2
31 - 50 years	3	42.9	5	26.3	8	30.8
Over 50 years	1	14.3	2	10.5	3	11.5
Total	7	100.0	19	100.0	26	100.0

Table 33: No. of Establishments that Introduced a New Process by Sub-sector

Sub-sector	Introduced a new process – Nos.		
	Yes	No	Total
Industrial gases	0	2	2
Paints, varnishes, lacquers and allied products	1	1	2
Cosmetics, soap, toilet preparation and pharmaceuticals	1	4	5
Glass, glass products and plastic products	1	1	2
Bricks and blocks	1	2	3
Readymix, other concrete products and cement	2	6	8
Petrochemicals	1	3	4
Total	7	19	26

Process innovation was more prevalent in establishments with 50-249 employees. Establishments with less than 10 employees reported no process innovation (Table 34).

Table 34: No. and Percentage of Establishments that Introduced a New Process by Employment

Employment	Introduced a new process					
	Yes		No		Total	
	No.	%	No.	%	No.	%
< 10 employees	0	0.0	4	100.0	4	100.0
10 - 49 employees	1	11.1	8	88.9	9	100.0
50 - 249 employees	5	50.0	5	50.0	10	100.0
250 and over employees	1	33.3	2	66.7	3	100.0
Total	7	26.9	19	73.1	26	100.0

Improved an Existing Process

Twelve establishments (46%) reported that they had improved an existing process while 14 (54%) responded negatively (Table 29). A relatively large percentage of establishments between 1-10 years and over 30 years old was engaged in process improvement (Table 35). In terms of the sub-sectors, improvement of an existing process was recorded throughout the various industrial groups (Table 36).

Table 35: No. and Percentage of Establishments that Improved an Existing Process by Age

Age of establishment	Improved an existing process					
	Yes		No		Total	
	No.	%	No.	%	No.	%
1 - 10 years	3	25.0	3	21.4	6	23.1
11 - 20 years	1	8.3	3	21.4	4	15.4
21 - 30 years	1	8.3	4	28.6	5	19.2
31 - 50 years	4	33.3	4	28.6	8	30.8
Over 50 years	3	25.0	0	0.0	3	11.5
Total	12	100.0	14	100.0	26	100.0

Table 36: No. of Establishments that Improved an Existing Process by Sub-sector

Sub-sectors	Improved an existing process – Nos.		
	Yes	No	Total
Industrial gases	1	1	2
Paints, varnishes, lacquers and allied products	2	0	2
Cosmetics, soap, toilet preparation and pharmaceuticals	1	4	5
Glass, glass products and plastic products	2		2
Bricks and blocks	2	1	3
Readymix, other concrete products and cement	3	5	8
Petrochemicals	1	3	4
Total	12	14	26

Table 37 shows that 70% of the establishments with 50-249 employees, 67% with 250 and over employees and 50% with less than 10 employees had improved an existing process.

Table 37: Percentage of Establishments that Improved an Existing Process by Employment

Employment	Improved an existing process - %		
	Yes	No	Total
< 10 employees	50.0	50.0	100.0
10 - 49 employees	11.1	88.9	100.0
50 - 249 employees	70.0	30.0	100.0
250 and over employees	66.7	33.3	100.0
Total	46.2	53.8	100.0

The establishments in the higher sales ranges (\$21m and over) reported relatively higher incidences of improvement to existing processes (Table 38). In terms of exports, ten (59%) establishments reported improvements in existing processes, while seven (41%) establishments recorded no improvements (Table 39).

Table 38: No. and Percentage of Establishments that Improved an Existing Process by Sales, 2007

Sales	Improved an existing process					
	Yes		No		Total	
	No.	%	No.	%	No.	%
Less than \$1m	0	0.0	1	7.1	1	3.8
\$1 - 5m	1	8.3	2	14.3	3	11.5
\$6 - 10m	0	0.0	2	14.3	2	7.7
\$11 - 15m	0	0.0	0	0.0	0	0.0
\$16 - 20m	1	8.3	2	14.3	3	11.5
\$21 - 50m	3	25.0	2	14.3	5	19.2
\$51 - 100m	3	25.0	0	0.0	3	11.5
More than \$100m	4	33.3	2	14.3	6	23.1
Not stated	0	0.0	3	21.4	3	11.5
Total	12	100.0	14	100.0	26	100.0

Table 39: No. and Percentage of Establishments that Improved an Existing Process by Export, 2007

Export	Improved an existing process		
	Yes	No	Total
Less than \$1m	1	3	4
\$1 - 5m	2	1	3
\$6 - 10m	2	1	3
\$21 - 50m	2		2
More than \$100m	3	2	5
Not applicable	1	6	7
Not stated	1	1	2
Total	12	14	26

Of the establishments that reported increased sales between 2006-2007, fifty-three percent (53%) indicated that they improved an existing process, while forty-seven percent (47%) had not (Table 40).

Table 40: Comparison of Sales, 2006-2007 with Improved Existing Process

Sales, 2006-2007	Improved an existing process - %		Total
	Yes	No	
Increased	52.6	47.4	100.0
Decreased	50.0	50.0	100.0
Stayed the same	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	46.2	53.8	100.0

Organisational Innovation

In relation to organisational innovation, seven different areas of activities were highlighted as follows:

- Introduced/improved quality assurance systems
- Introduced changes in management systems and techniques
- Introduced/improved maintenance routines and systems
- Improved plant layout
- Introduced/improved waste management procedures
- Implemented major changes in organisational strategy and structure
- Introduced/expanded in-house training programmes.

Sixty-one percent (61%) of the establishments indicated that they had introduced/improved quality assurance systems and introduced changes in management systems and techniques. Fifty-eight percent (58%) of the establishments had introduced/expanded in-house training programmes, while fifty-four percent (54%) introduced/improved maintenance routines and systems. Thirty-eight percent (38%) of the establishments stated that they had implemented major changes in organisational strategy and structure and between thirty to thirty-five percent (30-35%) had improved plant layout and waste management procedures (Table 41).

Table 41: No. and Percentage of Establishments Engaged in Organisational Innovation, 2006 and 2007

Organisational Innovation	Engaged in organizational innovation							
	Yes		No		Not stated		Total	
	No.	%	No.	%	No.	%	No.	%
Introduced/improved quality assurance systems	16	61.5	10	38.5	0	0.0	26	100
Introduced changes in management systems and techniques	16	61.5	9	34.6	1	3.8	26	100
Introduced/improved maintenance routines and systems	14	53.8	12	46.2	0	0.0	26	100
Improved plant layout	8	30.8	18	69.2	0	0.0	26	100
Introduced/improved waste management procedures	9	34.6	17	65.4	0	0.0	26	100
Implemented major changes in organisational strategy and structure	10	38.5	16	61.5	0	0.0	26	100
Introduced/expanded in-house training programmes	15	57.7	11	42.3	0	0.0	26	100

No clear pattern emerged with respect to the sub-sectors, sales and exports. The larger establishments employing in excess of fifty persons predominated in all of the categories of organisational innovation. (Detailed data available on request)

Marketing Innovation

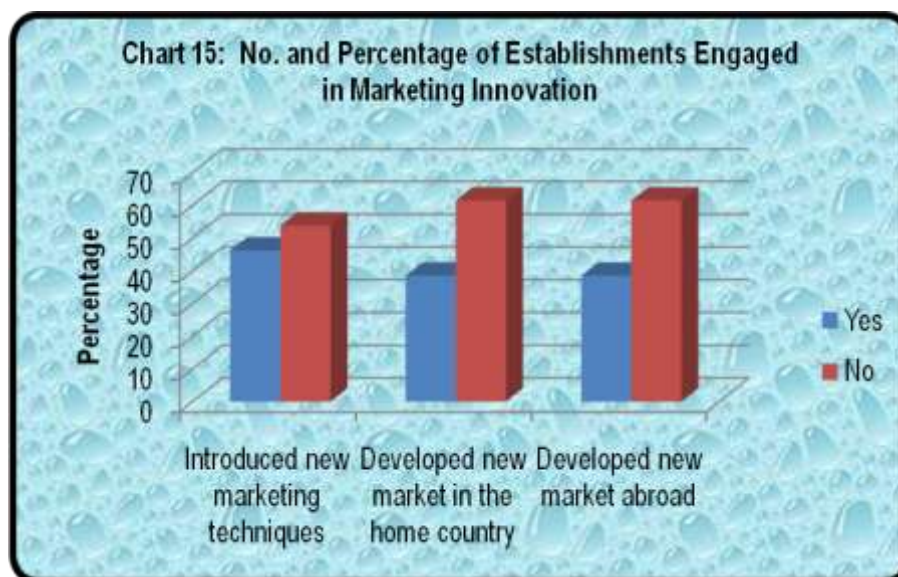
Marketing innovation encompassed the following three activities:

- Introduced new marketing techniques
- Developed a new market in the home country
- Developed a new market abroad

Forty-six percent (46%) of the establishments stated that they had introduced new marketing techniques, while thirty-eight percent (38%) in each case developed a new market at home and abroad (Table 42).

Table 42: No. and Percentage of Establishments Engaged in Marketing Innovation

Marketing innovation	Engaged in marketing innovation					
	Yes		No		Total	
	No.	%	No.	%	No.	%
Introduced new marketing techniques	12	46.2	14	53.8	26	100
Developed new market in the home country	10	38.5	16	61.5	26	100
Developed new market abroad	10	38.5	16	61.5	26	100



Establishments in all the sub-sectors participated in introducing new marketing techniques (Table 43).

Table 43: No. of Establishments that Introduced New Marketing Techniques by Sub-sector

Sub-sector	Introduced new marketing techniques – Nos.		
	Yes	No	Total
Industrial gases	1	1	2
Paints, varnishes, lacquers and allied products	2		2
Cosmetics, soap, toilet preparation and pharmaceuticals	2	3	5
Glass, glass products and plastic products	1	1	2
Bricks and blocks	1	2	3
Readymix, other concrete products and cement	4	4	8
Petrochemicals	1	3	4
Total	12	14	26

Of establishments that reported increased sales over the period, 2006-2007 fifty-three percent (53%) had introduced new marketing techniques, while 47% in each case had developed new markets at home and abroad (Tables 44, 45 and 46).

Table 44: Comparison of Sales, in 2006-2007 by Introducing New Marketing Techniques

Sales 2006-2007	Introduced new marketing techniques - %		Total
	Yes	No	
Increased	52.6	47.4	100.0
Decreased	50.0	50.0	100.0
Stayed the same	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	46.2	53.8	100.0

Table 45: Comparison of Sales, 2006-2007 by Developing New Market at Home

Sales, 2006-2007	Developed new market at home - %		Total
	Yes	No	
Increased	47.4	52.6	100.0
Decreased	0.0	100.0	100.0
Stayed the same	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	38.5	61.5	100.0

Table 46: Comparison of Sales, 2006-2007 by Developing New Market Abroad

Sales, 2006-2007	Developed new market abroad - %		Total
	Yes	No	
Increased	47.4	52.6	100.0
Decreased	0.0	100.0	100.0
Stayed the same	50.0	50.0	100.0
Not stated	0.0	100.0	100.0
Total	38.5	61.5	100.0

Table 47: No. and Percentage of Exporting Establishments Engaged in Marketing Innovation

Activity	Yes		No.		Total	
	No.	%	No.	%	No.	%
Introduced new marketing techniques	10	59.0	7	41.0	17	100.0
Developed new market at home	7	41.0	10	59.0	17	100.0
Developed new market abroad	9	53.0	8	47.0	17	100.0

Of the seventeen establishments that reported export sales in 2007, ten (59%) had introduced new marketing techniques, seven (41%), and nine (53%) developed new markets at home and abroad respectively (Table 47). The value of export sales ranged from less than \$1m to in excess of \$100m (Tables 48, 49, 50).

Table 48: Export Sales, 2007 by Establishment that Introduced New Marketing Techniques

Sales, 2007	Introduced new marketing techniques		Total
	Yes	No	
Less than \$1m	2	2	4
\$1 - 5m	2	1	3
\$6 - 10m	2	1	3
\$11 - 15m	0	0	0
\$16 - 20m	0	0	0
\$21 - 50m	2	0	2
More than \$100m	2	3	5
Not applicable	1	6	7
Not stated	1	1	2
Total	12	14	26

Table 49: Export Sales, 2007 by Establishments that Developed New Market at Home

Sales, 2007	Developed new market at home		Total
	Yes	No	
Less than \$1m	2	2	4
\$1 - 5m	2	1	3
\$6 - 10m	2	1	3
\$11 - 15m	0	0	0
\$16 - 20m	0	0	0
\$21 - 50m	1	1	2
More than \$100m	0	5	5
Not applicable	2	5	7
Not stated	1	1	2
Total	10	16	26

Table 50: Export Sales, 2007 by Establishment that Developed New Market Abroad

Sales, 2007	Developed new market abroad – nos.		Total
	Yes	No	
Less than \$1m	3	1	4
\$1 - 5m	1	2	3
\$6 - 10m	2	1	3
\$11 - 15m	0	0	0
\$16 - 20m	0	0	0
\$21 - 50m	2	0	2
More than \$100m	1	4	5
Not applicable	0	7	7
Not stated	1	1	2
Total	10	16	26

Driving Forces and Obstacles to Innovation

Reasons for Innovating

Eleven reasons were adduced for innovating as shown in Table 51:

- Reduce production costs
- Improve productivity
- Extend product range
- Improve product quality
- Increase market share
- Improve customer satisfaction
- Deal with new competitors at home
- Deal with new competitors in export markets
- Improve working conditions
- Develop more environmentally friendly products and services
- Comply with local laws and standards

Table 51 shows that the major reasons for innovating were improving productivity, reducing production costs, and improving customer satisfaction and product quality, which were rated as very important by 69%, 65%, 65% and 61% of the respondents respectively. To comply with local laws and standards (58%), increase market share (50%), and improve working conditions (50%) were also identified as very important. The lowest rating was assigned to extending the product range, in that only 31% of respondents stated that it was very important and 19% not important. Approximately one-third of respondents considered dealing with new competitors both at home (31%) and in the export markets (35%) to be very important and 15% not important. Environmental issues received similar rating since only 35% of respondents indicated that developing more environmentally friendly products and processes to be very important, and 8% not important.

Table 51: Rating of Reasons for Innovating

Reason	Rating – percentage of establishments						Total
	Not important	Slightly important	Moderately important	Very important	Not applicable	Not stated	
Reduce production costs	3.8	0.0	3.8	65.4	19.2	7.7	100
Improve productivity	0.0	0.0	7.7	69.2	19.2	3.8	100
Extend product range	19.2	3.8	23.1	30.8	19.2	3.8	100
Improve product quality	7.7	0.0	0.0	61.5	19.2	11.5	100
Increase market share	11.5	3.8	7.7	50.0	19.2	7.7	100
Improve customer satisfaction	0.0	7.7	7.7	65.4	19.2	0.0	100
Deal with new competitors at home	15.4	3.8	19.2	30.8	19.2	11.5	100
Deal with new competitors in export markets	15.4	11.5	11.5	34.6	19.2	7.7	100
Improve working conditions	0.0	3.8	15.4	50.0	19.2	11.5	100
Develop more environmental-friendly products and processes	7.7	7.7	19.2	34.6	19.2	11.5	100
Comply with local laws or standards	0.0	0.0	19.2	57.7	19.2	3.8	100
Other	0.0	0.0	0.0	0.0	19.2	80.8	100

Obstacles to Innovation

Eleven obstacles to innovation were identified as shown in Table 52:

- High cost of innovation project
- Lack of financing
- Lack of skilled/qualified personnel
- Long administrative/approval process within the establishment
- Lack of information on technology itself
- Lack of information on markets
- Domestic economic conditions
- Legislation/legal restrictions/administrative procedures affecting the innovation
- Weak customer demand
- Lack of marketing capability
- Lack of external technical support services

Table 52: Rating of Obstacles to Innovation

Obstacle	Rating – percentage of establishment					
	Total	Not relevant/ appropriate	Slightly significant	Moderately significant	Very significant	Not stated
High cost of innovation project	100	19.2	15.4	15.4	30.8	19.2
Lack of financing	100	34.6	11.5	19.2	23.1	11.5
Lack of skilled/qualified personnel	100	15.4	15.4	19.2	38.5	11.5
Long administrative/ approval process within the establishment	100	65.4	11.5	3.8	3.8	15.4
Lack of information on technology itself	100	34.6	19.2	23.1	11.5	11.5
Lack of information on markets	100	26.9	3.8	26.9	26.9	15.4
Domestic economic conditions	100	26.9	19.2	11.5	26.9	15.4
Legislation/legal restrictions/administrative procedures affecting the innovation	100	42.3	19.2	15.4	7.7	15.4
Weak customer demand	100	38.5	7.7	19.2	11.5	23.1
Lack of marketing capability	100	26.9	15.4	23.1	15.4	19.2
Lack of external technical support services	100	34.6	15.4	26.9	11.5	11.5
Other	100	3.8	0.0	0.0	0.0	96.2

The main obstacles to innovation were identified as the lack of skilled/qualified personnel and the high cost of the innovation project, which 38% and 31%, of respondents, respectively, stated to be very significant. The survey results also showed lack of information on markets (27%), domestic economic conditions (27%), and lack of financing (23%) to be very significant. On the other hand, 65% of respondents indicated that long administrative/approval process within the establishment was not relevant/appropriate and 42% expressed the same view with regard to legislation. Weak customer demand (38%) lack of information on technology itself (35%) and lack of external technical support (35%) were considered not relevant/appropriate. More respondents reported lack of financing to be not relevant/ appropriate (35%) than to be very significant (23%) (Table 52).

Linkages and Learning

The importance of the role of linkages and collaboration for innovation was explored. Some linkages may involve a specific flow of information and knowledge, for example, ownership linkages, and sub-contracting/outsourcing relationships. Based on the results of the survey, however, ownership, sub-contracting and outsourcing relationships were not significant in this regard (Tables 2, 13 and 15). The use of other linkages as sources of information, types of information obtained from these sources, co-operative and collaborative arrangements, and reasons for collaboration were addressed in the survey.

Sources of Information

Eleven sources of information were identified as follows:

- Within your establishments
- Parent establishment
- Customers
- Client establishment with which the respondent is a sub-contractor
- Suppliers of equipment, material and components or software
- Consultancy establishments
- Government or public research institutes
- Fairs /exhibitions, conference
- Business and industry associations
- Professional journals and trade publications
- Education and research institutes

The majority of respondents identified customers (54%) and their establishments (46%) as very important sources of information. Suppliers of equipment, material and components of software and the parent establishment were also viewed as very important by 23% of respondents.

Nineteen percent (19%) of respondents in each case viewed business and industry associations, consultancy establishments, and professional and trade publications as very important while between 31-35 % of respondents stated that these sources of information were moderately important and 19-27% did not use them. Fairs, exhibitions and conferences were considered mainly moderately important by 42% of respondents, while 19% did not use them.

With respect to education and research institutions 23% and 19% of respondents reported that they were very important and moderately important, respectively, while 35% stated that they were not used. Only 4% of respondents considered government or public research institutions to be very important sources of information, while 27% indicated that they were moderately important and 42% did not use them (Table 53).

Table 53: Rating of Sources of Information

Source of information	Rating - percentage					
	Total	Not used	Moderately Important	Very important	Not stated	Not applicable
Within your establishment	100	7.7	19.2	46.2	7.7	19.2
Parent establishment	100	34.6	11.5	23.1	11.5	19.2
Customers	100	7.7	11.5	53.8	7.7	19.2
Client establishment for which the respondent is a sub-contractor	100	42.3	15.4	7.7	15.4	19.2
Suppliers of equipment, material and components or software	100	11.5	34.6	23.1	11.5	19.2
Consultancy establishments	100	23.1	30.8	19.2	7.7	19.2
Government or public research institutes	100	42.3	26.9	3.8	7.7	19.2
Fairs, exhibitions, conferences	100	19.2	42.3	15.4	3.8	19.2
Business and industry associations	100	19.2	34.6	19.2	7.7	19.2
Professional journals and trade publications	100	26.9	30.8	19.2	3.8	19.2
Education and research institutes	100	34.6	19.2	23.1	3.8	19.2
Other	100	7.7			73.1	19.2

Types of Information

Customers were identified as the major source of product related information by 50% of respondents, followed by suppliers of equipment, material and components of software (31%) and information within the establishment (31%) (Table 54).

Table 54: Sources of Product Related Information

Source	Total	Product related information percentage of establishments			
		Yes	No	Not Stated	Not Applicable
Within your establishment	100.0	31.0	46.0	0.0	23.0
Parent establishment	100.0	0.0	77.0	0.0	23.0
Customers	100.0	50.0	27.0	4.0	19.0
Client establishment for which the respondent is a sub-contractor	100.0	15.0	62.0	0.0	23.0
Suppliers of equipment, material and components or software	100.0	31.0	46.0	0.0	23.0
Consultancy establishments	100.0	12.0	65.0	0.0	23.0
Government ministries or public research institutions	100.0	12.0	65.0	0.0	23.0
Fairs, exhibitions, conferences	100.0	27.0	50.0	0.0	23.0
Business and industry associations	100.0	15.0	62.0	0.0	23.0
Professional journals and trade publications	100.0	19.0	58.0	0.0	23.0
Education and research institutes	100.0	12.0	65.0	0.0	23.0
Other	100.0	77.0	19.0	0.0	4.0

The survey results show suppliers of equipment material and components of software (46%), professional journals and trade publications (46%) and in-house sources (42%) as major sources of process related information (Table 55).

Table 55: Sources of Process Related Information

Source	Total	Process related information percentage			
		Yes	No	Not stated	Not applicable
Within your establishment	100.0	42.0	35.0	0.0	23.0
Parent establishment	100.0	8.0	69.0	0.0	23.0
Customers	100.0	12.0	65.0	4.0	19.0
Client establishment for which the respondent is a sub-contractor	100.0	23.0	54.0	0.0	23.0
Suppliers of equipment, material and components or software	100.0	46.0	31.0	0.0	23.0
Consultancy establishments	100.0	35.0	42.0	0.0	23.0
Government ministries or public research institutions	100.0	8.0	69.0	0.0	23.0
Fairs, exhibitions, conferences	100.0	27.0	50.0	0.0	23.0
Business and industry associations	100.0	27.0	50.0	0.0	23.0
Professional journals and trade publications	100.0	46.0	31.0	0.0	23.0
Education and research institutes	100.0	39.0	39.0	0.0	23.0
Other	100.0	77.0	19.0	0.0	4.0

Respondents indicated that the main sources of marketing related information were within the establishment (39%), customers (35%), and fairs, exhibitions and conferences (31%) (Table 56). Management related information (46%) was obtained from sources within the establishment (Table 57).

Table 56: Sources of Marketing Related Information

Source	Total	Marketing related information – percentage			
		Yes	No	Not Stated	Not Applicable
Within your establishment	100.0	39.0	39.0	0.0	23.0
Parent establishment	100.0	8.0	69.0	0.0	23.0
Customers	100.0	35.0	42.0	19.0	4.0
Client establishment for which the respondent is a sub-contractor	100.0	4.0	73.0	0.0	23.0
Suppliers of equipment, material and components or software	100.0	8.0	69.0	0.0	23.0
Consultancy establishments	100.0	23.0	54.0	0.0	23.0
Government ministries or public research institutions	100.0	19.0	58.0	0.0	23.0
Fairs, exhibitions, conferences	100.0	31.0	46.0	0.0	23.0
Business and industry associations	100.0	8.0	69.0	0.0	23.0
Professional journals and trade publications	100.0	19.0	58.0	0.0	23.0
Education and research institutes	100.0	8.0	69.0	0.0	23.0
Other	100.0	77.0	19.0	0.0	4.0

Table 57: Sources of Management Related Information

Source	Total	Management related information percentage			
		Yes	No	Not stated	Not applicable
Within your establishment	100.0	46.0	31.0	0.0	23.0
Parent establishment	100.0	23.0	54.0	0.0	23.0
Customers	100.0	8.0	69.0	4.0	19.0
Client establishment for which the respondent is a sub-contractor	100.0	12.0	65.0	0.0	23.0
Suppliers of equipment, material and components or software	100.0	4.0	73.0	0.0	23.0
Consultancy establishments	100.0	19.0	58.0	0.0	23.0
Government ministries or public research institutions	100.0	12.0	65.0	0.0	23.0
Fairs, exhibitions, conferences	100.0	8.0	69.0	0.0	23.0
Business and industry associations	100.0	12.0	65.0	0.0	23.0
Professional journals and trade publications	100.0	12.0	65.0	0.0	23.0
Education and research institutes	100.0	12.0	65.0	0.0	23.0
Other	100.0	77.0	19.0	0.0	4.0

Co-operative and Collaborative Arrangement

Co-operative and collaborative arrangement involved the active participation in joint projects between the respondent establishment and other establishments or organisations.

Thirty-one percent (31%) of the responding establishments stated that they had collaborative arrangements with customers while twenty-seven percent (27%) had such arrangements with associated establishments and suppliers. Co-operative arrangements were also entered into with universities or higher education institutes (23%), consulting and marketing establishments (19%), government ministries (15%) and private research institutions (15%). Only 8% of establishments were engaged in such arrangements with competitors (Table 58).

Table 58: Sources of Co-operative and Collaborative Arrangements

Source	Percentage of establishments					
	Total	Yes	No	Do not know	Not Stated	Not applicable
Competitor	100.0	7.7	61.5	3.8	7.7	19.2
Customers	100.0	30.8	42.3	0.0	7.7	19.2
Suppliers	100.0	26.9	46.2	0.0	7.7	19.2
Associated establishments within your corporate group	100.0	26.9	46.2	0.0	7.7	19.2
Consulting and marketing establishments	100.0	19.2	53.8	0.0	7.7	19.2
Private research institutes	100.0	15.4	53.8	3.8	19.2	7.7
Public research institutes	100.0	3.8	61.5	3.8	11.5	19.2
Universities or higher education institutes	100.0	23.1	42.3	3.8	11.5	19.2
Government ministry	100.0	15.4	53.8	0.0	11.5	19.2
Other	100.0	0.0	15.4	3.8	61.5	19.2

Reasons for Collaboration

A relatively large proportion of the respondents cited accessing critical expertise (46%), and research and development (42%) as reasons for collaboration. Thirty-eight percent (38%) identified accessing new markets and 31% new distribution channels, and 27% in each case of sharing of costs and spreading risks (Table 59).

Table 59: Reasons for Collaboration

Reason	Percentage of establishments				
	Total	Yes	No	Not stated	Not applicable
Sharing costs	100	26.9	38.5	11.5	23.1
Spreading risks	100	26.9	38.5	11.5	23.1
Accessing research and development	100	42.3	23.1	11.5	23.1
Prototype development	100	15.4	50	11.5	23.1
Scaling-up production processes	100	19.2	46.2	11.5	23.1
Accessing critical expertise	100	46.2	19.2	11.5	23.1
Accessing new markets	100	38.5	26.9	11.5	23.1
Accessing new distribution channels	100	30.8	34.6	11.5	23.1
Other	100	3.8	57.7	15.4	23.1

Impact of Innovation

Table 60 reveals the results of the impact of innovation on key performance indicators. Fifty-eight percent (58%) of respondents indicated that innovation resulted in increased productivity, and competitiveness, while 54% stated increased profitability. Between 42-46% recorded increases in export growth, product differentiation, cash flow and service quality, while 31% reported increased employment and domestic market share. Twenty-three percent (23%) attributed increased diversification and compliance with regulations to their innovative activities. Only 15% of respondents reported that innovation had a positive environmental impact.

Table 60: Impact of Innovation on Performance Indicators

Indicator	Impact – percentage of establishments						
	Total	No change	Decrease	Increase	Do not know	Not stated	Not applicable
Profitability	100	3.8	3.8	53.8	7.7	11.5	19.2
Market share (domestic market)	100	34.6	3.8	30.8	3.8	7.7	19.2
Export growth	100	23.1		42.3	7.7	7.7	19.2
Productivity	100	3.8		57.7	7.7	11.5	19.2
Competitiveness	100	3.8		57.7	7.7	11.5	19.2
Cash flow	100	11.5	3.8	46.2	7.7	11.5	19.2
Diversification	100	38.5		23.1	7.7	11.5	19.2
Product differentiation (including changes in quality)	100	26.9		42.3	3.8	7.7	19.2
Positive environmental impact	100	23.1	3.8	15.4	23.1	15.4	19.2
Compliance with regulations	100	30.8	3.8	23.1	11.5	11.5	19.2
Employment	100	30.8	3.8	30.8		15.4	19.2
Service quality	100	23.1		42.3	7.7	7.7	19.2
Other	100					80.8	19.2

Policy Related Issues

Questions drawn from various elements of the survey attempted to determine how the respondent establishments perceived government's role with respect to innovation.

Fifty-eight percent (58%) of respondents indicated that complying with local laws or standards was a very important reason for innovation (Table 51). Thirty-one percent (31%) stated that government or public research institutions were very important/moderately important sources of information for innovation (Table 53). Fifteen percent (15%) had been involved in collaborative activity with government ministries, while only 4% indicated any involvement with public research institutions (Table 58).

Twenty-three percent (23%) of respondents reported that innovative activity impacted positively on their compliance with regulations, while only 15% stated that their innovative activity had a positive environmental impact (Table 60). However, 23% of respondents reported that legislation/legal procedures were very/moderately significant hindrances to innovation activity (Table 52).

With respect to support programmes, 23 establishments or eighty-eight percent (88%) did not use state support or assistance in their innovative activity (Table 61).

Table 61: No. and Percentage of Establishments that Use Government Support or Assistance

Use support or assistance	Establishments	
	No.	Percent
Yes	1	3.8
No	23	88.5
Do not know	1	3.8
Not stated	1	3.8
Total	26	100

Government support programmes for innovation were reported as not applicable by an overwhelming ninety-two percent (92%) of establishments (Table 62).

Table 62: Rating of Government Support Programmes for Innovation

Program	Rating – percentage of establishments						
	Total	Not important	Slightly important	Important	Very important	Not stated	Not applicable
Research and development funding	100	0.0	0.0	0.0	3.8	3.8	92.3
Training	100	0.0	0.0	3.8	0.0	3.8	92.3
Subsidies	100	0.0	0.0	0.0	3.8	3.8	92.3
Tax rebates	100	0.0	0.0	0.0	3.8	3.8	92.3
Technical support/advice	100	0.0	0.0	3.8	0.0	3.8	92.3
Infrastructure support	100	0.0	0.0	0.0	3.8	3.8	92.3
Loans and grants	100	0.0	0.0	0.0	3.8	3.8	92.3
Venture capital support	100	0.0	0.0	3.8	0.0	3.8	92.3
Other	100	0.0	0.0	0.0	0.0	7.7	92.3

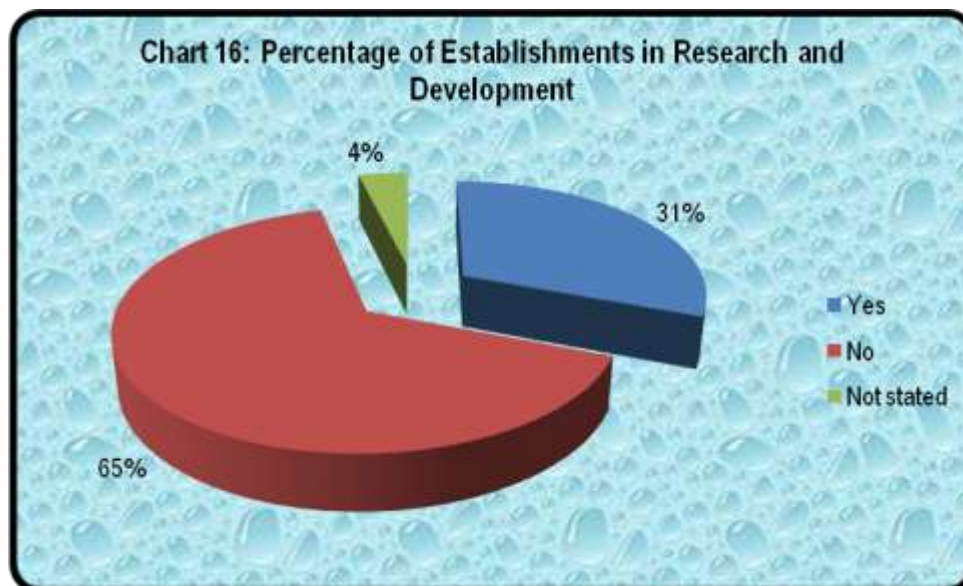
In response to an open question in relation to how government can encourage innovation in establishments there was a range of responses including: reduce taxes and duties; exercise better control over importation of sub-standard or dumped products; provide grants and intellectual capital to support the innovation process; provide concessions on research and development (R&D) equipment and expenditures; provide workshop/ engineering support to design and build machinery; provide qualified engineering consultancy support; place continued emphasis on education for skills; revitalize R&D in agriculture; improve public services; control inflation; and promote existing incentives.

Research and Development

Thirty-one percent (31%) of establishments stated that they had undertaken research and development activities while 65% responded negatively (Table 63).

Table 63: Research and Development

Research and development	Establishments	
	No.	Percent
Yes	8	30.8
No	17	65.4
Not stated	1	3.8
Total	26	100.0



Only one establishment (4%) had utilised patents to protect its intellectual property, while four (15%) utilised trademarks, one (4%) copyright, and three (12%) in each case, confidentiality agreements and trade secrets (Table 64).

Table 64: Protection of Intellectual Property

Method to protect intellectual property	Total		Yes		No		Not stated		Not applicable	
	No.	%	No.	%	No.	%	No.	%	No.	%
Patents	26	100.0	1	4.0	7	27.0	1	4.0	17	65.4
Trademarks	26	100.0	4	15.0	4	15.0	1	4.0	17	65.4
Copyrights	26	100.0	1	4.0	7	27.0	1	4.0	17	65.4
Confidentiality agreements	26	100.0	3	12.0	5	19.0	1	4.0	17	65.4
Trade secrets	26	100.0	3	12.0	5	19.0	1	4.0	17	65.4
Other	26	100.0	1	4.0	7	27.0	1	4.0	17	65.4

Use of the Internet

The vast majority of respondents, ninety-two percent (92%), utilised the internet while the same percentage used it for e-mail. Eighty-eight percent (88%) utilised the internet for world web searches, 35 % to sell products or services to clients, and 50% for advertising through a home page (Tables 65 and 66).

Table 65: Internet Usage

Internet usage	No. of establishments	Percentage
Yes	24	92.0
No	2	7.7
Total	26	100.0

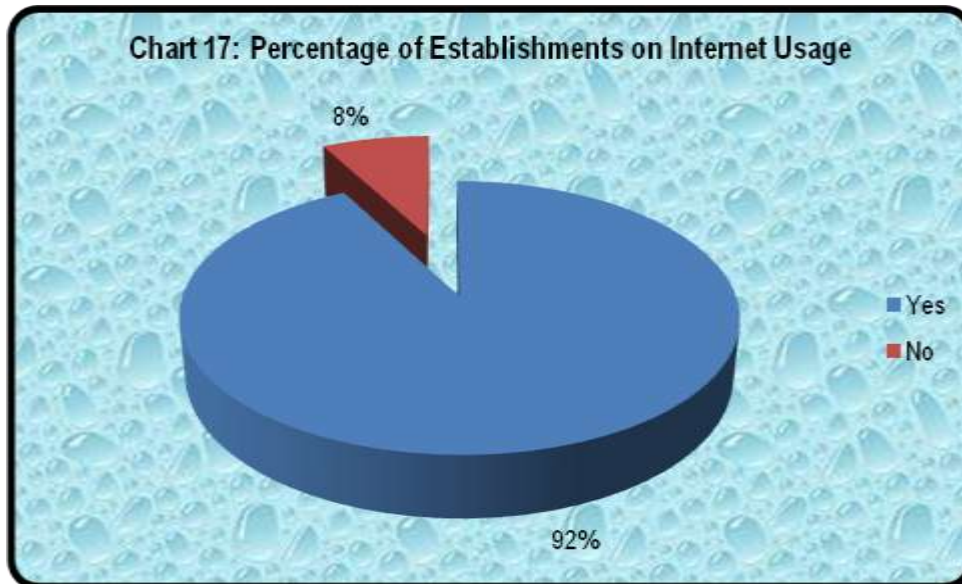


Table 66: Purpose of Internet Usage

Purpose	Usage							
	Total		Yes		No		Not applicable	
	No.	%	No.	%	No.	%	No.	%
For email	26	100.0	24	92.3	0.0	0.0	2	7.7
For searches on the world wide web	26	100.0	23	88.5	1	3.8	2	7.7
For selling your products or services to customers or clients	26	100.0	9	34.6	15	58.0	2	7.7
For advertising through a home page	26	100.0	13	50.0	11	42.0	2	7.7

Summary of Main Findings and Conclusion

Innovation Activities

- (i) The majority of responding establishments (73%) was local/privately owned. There was a relatively small percentage of licensing contracts for product or process technology and virtually no outsourcing arrangements in place. Licensing/outsourcing arrangements with foreign establishments were therefore not significant mechanisms for the transfer of technology and the diffusion of innovation in the sector. The importation of machinery and equipment pointed to the possible diffusion of innovation through the use of embodied technology.
- (ii) Product innovation was more prevalent amongst older establishments, and was more widely practised than process innovation. Fifty percent (50%) of the establishments indicated that they had introduced a new product, compared to twenty-seven percent (27%) that introduced a new process. A similar percentage (46%) of the respondents had improved an existing product and an existing process. Product and process innovation were more prevalent amongst larger establishments with fifty employees and more.
- (iii) The main areas of focus with respect to organisational innovation were the introduction/improvement of quality assurance systems, and changes in management systems and techniques (61%), introduction/ expansion of in-house training (58%), followed by the improvement of maintenance systems (54%). The larger establishments employing fifty persons and more predominated in all of the categories of organisational innovation.
- (iv) With respect to marketing innovation, forty-six percent (46%) of the establishments reported the introduction of new marketing techniques, while 38% developed new markets at home or abroad. Establishments in all the sub-sectors participated, to some extent, in innovative marketing activities.

Driving Forces and Obstacles to Innovation

The following reasons for innovating were cited by respondents as very important:

- Improve productivity (69%)
- Customer satisfaction (65%)
- Reduce production cost (65%)
- Improve product (61%)

The lowest ranking was given to extending the product range with only thirty-one percent (31%) of respondents reporting this to be very important.

The main obstacles to innovation were identified as the lack of skilled/qualified personnel and high cost of the innovation project, followed by lack of information and domestic economic conditions. More respondents considered lack of financing to be not relevant/ appropriate (35%) than to be very significant (23%).

Linkages and Collaboration

Customers were rated as very important sources of information for innovation by 54% of the respondents; similar ratings were given to in-house information (46%), suppliers (23%) and the parent establishment (23%). With respect to education and research institutions 23% and 19% of respondents reported that they were very important and moderately important, respectively, while 35% stated that they were not used. Only 4% of respondents considered government ministries or public research institutions to be very important, while 27% indicated that they were moderately important and 42% did not use their services.

Customers were identified as the most significant source with respect to entry into co-operative/collaborative arrangements (31%), followed by associated establishments and suppliers (27%). Twenty-three percent (23%) of respondents had been involved in collaborative activity with universities and higher education institutions, while 15% acknowledged similar activity with private research institutions and government ministries.

Impact of Innovation

The impact of innovation was reported to be greatest with respect to increased productivity (56%), competitiveness (58%) and profitability (54%). Between 42-46% recorded increases in export growth, product differentiation, service quality and cash flow, while 31% reported increased employment and domestic market share. Twenty-three percent (23%) attributed increased diversification and improved compliance with regulators to their innovative activities. Only 15% of respondents reported that innovation had a positive environmental impact.

Research and Development

Approximately one-third (31%) of the establishments indicated that they had undertaken research and development, while 65% responded negatively. This is consistent with the relatively low number of scientists and engineers employed, with 23% of respondents employing no scientists and engineers, and 50% employing between 1-3 scientists and engineers. Only one establishment utilised patents to protect its intellectual property. Others, however, utilised trademarks, confidentiality agreements and trade secrets to some extent to protect their intellectual property.

Role of Government

The majority of respondents (88%) had not utilised government support or assistance in their innovation activity. Government support programmes were viewed as non- applicable by an overwhelming 92% of establishments. Compliance with local laws or standards was identified as very important for innovation by 58% of respondents, while only 15% reported that their innovative activity had a positive environmental impact.

Government or public research institutions were rated as very/moderately important sources of information (31% of respondents). Collaboration with government ministries was acknowledged by 15% of respondents, with a mere 4% collaborating with public research institutions. However, 23% of respondents stated that legislation/legal restrictions/administrative procedures were very/moderately significant obstacles to innovative activity.

Respondents indicated that government can encourage innovation in establishments by:

- reducing taxes and duties; providing grants and intellectual capital to support the innovation process; providing concessions on R&D equipment and expenditures; providing workshop/ engineering support to design and build machinery; providing qualified engineering consultancy support; providing research and development information; placing continued emphasis on education for skills, revitalising R&D in agriculture.