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**INNOVATION IN SELECTED
AUSTRALIAN INDUSTRIES**

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1. BACKGROUND

At the 1994 meeting of the Voorburg Group in Sydney, Statistics Canada and the Australian Bureau of Statistics (ABS) jointly presented a paper which described a model for the collection of innovation statistics for service sector industries. At that meeting the ABS outlined a survey that it was conducting in respect of the services sector. It was asked to report back to the 1995 meeting on the results of that survey and the experience that it gained. This paper fulfils that commitment.

2. The Innovation surveys conducted around the world have in the main concentrated on the measurement of technological innovation in the Manufacturing sector. They have generally been conducted in accordance with the joint OECD / Eurostat manual (OECD, *Oslo manual - OECD Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*, OCDE/GD (92)26 (Paris), 1992). The Oslo manual formed the basis of ABS activities in developing its innovation survey in the Manufacturing sector, although the ABS proceeded beyond the OECD guidelines in some cases, particularly in the collection of data about non-technological innovation. For the survey of other industries the ABS adopted similar concepts.

3. ABS had several objectives for its survey of innovative activities in other (particularly services) industries. These were:

- a) to identify whether a similar approach to that used for the Manufacturing sector was suitable for other industries,
- b) to see whether innovation was more prevalent in particular industries, or size of business, perhaps leading to the development of a priority set of industries to be studied in more detail,
- c) to see whether there is a difference between the prevalence of technological and non-technological innovation in these industries, and
- d) to see what type of activities were regarded as technological or non-technological innovation by businesses in Australia.

4. Users of science and technology and industrial statistics data in Australia were convinced that the phenomenon of non-technological innovation was going to be important in the services sector, much more so than in the Manufacturing sector. Hence the ABS placed more emphasis on this aspect of the collection than might otherwise have been the case. If these innovations affect business growth (and hence the growth of the economy) then the users of Australian data believed they should be measured.

2. THE SURVEY

5. Due to the limited resources available for data collection, the ABS developed a simple questionnaire that would enable the main objectives to be met. This meant that innovation would need to be measured in a similar way to that used in the Manufacturing survey i.e. by asking businesses whether or not they had introduced any new, or significantly changed, goods or services or ways of delivering those goods and services.

6. It was felt that for service sector businesses that it may not be possible to distinguish between new (or changed) services and the way in which they are delivered. Hence these two questions were combined, whereas for the manufacturing survey, there was a distinction drawn between product and process innovation. ABS did however ask separately for data about new (or changed) goods, as it is possible that these industries would produce goods as well as services.

7. To enable ABS to get a better indication of what sort of things businesses would consider to fit into these categories the questionnaire asked for a description of the services or goods being reported. A list of the most commonly reported services or goods are shown in Attachment 1.

8. A stratified random sample of businesses were selected from the businesses included in the following Australian and New Zealand Standard Industrial Classification (ANZSIC) divisions:

- Mining
- Electricity, gas and water supply
- Construction
- Wholesale trade
- Retail trade
- Accommodation, cafes and restaurants
- Transport and storage
- Communication services
- Finance and insurance
- Property and business services
- Education
- Health and community services
- Cultural and recreational services
- Personal and other services (excluding religious services)

Businesses were selected from all sized businesses included on the ABS Business Register i.e. the only exclusion was those businesses which did not have any employees.

9. Similarly to the manufacturing survey, the statistical (and collection) unit was the business. Other than the descriptive material referred to earlier there was no information collected in respect of specific innovations. (Readers should note that in the ABS survey of the Manufacturing sector, data was collected about the main innovation of the business, as well as in respect of the business itself.)

10. As stated earlier the ABS survey also looked at the issue of non-technological innovation. Respondents were asked to report any non-technological innovations (which would not be commercialised) and hence would not be reported in the earlier questions. These innovations were categorised into the following types:

- a) the implementation of advanced management techniques,
- b) the implementation of significantly changed organisational structures, and
- c) the implementation of new or substantially changed corporate directions.

11. One major difference to the Manufacturing survey was in respect of the reference period to which the innovations related. In this survey the reference period was 1 July 1993 to 30 June 1994. The survey of the Manufacturing industry related to the reference period 1 July 1991 to 30 June 1994. The three year period is the recommended standard for the measurement of technological innovation in the Manufacturing industry. However the ABS, and its statistical users, felt that a three year period for the measurement of innovative activity in the services sector would be inappropriate given the likely shorter time frame of the innovations and the rapid turnover of businesses in this sector.

3. RESULTS OF AUSTRALIAN SURVEY

12. Presented in this section are some results of the survey. In Table 1, below, businesses are classified by industry and type of innovative activity(s) undertaken. Also included are the Manufacturing Sector results for comparison. These results are not directly comparable because of the different collection periods, three years for the Manufacturing survey (1 July 1991 to 30 June 1994), compared with one year for the selected non-manufacturing industries (1 July 1993 to 30 June 1994).

1 PROPORTION OF BUSINESSES UNDERTAKING INNOVATIVE ACTIVITIES¹, JUNE 1994

	<i>Innovation type</i>		<i>Tech-</i>	<i>Non-tech-</i>	<i>One or</i>
	<i>Goods</i>	<i>Services</i>	<i>nological</i> ²	<i>nological</i>	<i>more</i>
<i>Selected industries</i> ³	%	%	%	%	%
Wholesale trade	13.2	8.7	18.0	25.9	33.5
Retail trade	6.7	10.4	12.8	7.2	17.7
Accommodation, cafes and restaurants	9.0	7.3	10.6	15.9	22.1
Transport and storage	3.2	6.4	6.5	12.9	17.4
Communication services	0.4	20.6	20.9	16.2	21.4
Finance and insurance	0.5	6.8	7.0	11.0	13.7
Property and business services	3.6	8.5	11.4	14.6	20.3
Education	0.2	16.9	17.0	23.1	26.4
Health and community services	4.2	9.8	10.4	16.4	21.8
Cultural and recreational services	3.8	19.0	19.9	17.6	30.6
Personal and other services	3.7	6.2	9.2	15.4	19.9
Subtotal Services⁴	5.4	8.7	11.5	13.9	20.5
Mining	8.4	2.0	9.7	28.5	31.8
Electricity, gas and water supply	3.1	16.0	17.2	45.4	46.4
Construction	3.5	5.5	7.9	10.8	15.3
Total all selected industries	5.4	8.7	11.5	14.0	20.6
Manufacturing⁵	29.9	23.1	33.7	24.2	42.8

¹Relates to innovation undertaken during the period July 1993 to June 1994

²Those businesses which undertook goods and/or services innovation during the period July 1993 to June 1994

³Excludes Agriculture, forestry and fishing, Manufacturing and Government, administration and defence

⁴Total selected industries excluding Mining, Electricity, gas and water supply and Construction

⁵Relates to innovation undertaken during the period July 1991 to June 1994

13. For all non-manufacturing industries surveyed, 21% of businesses undertook at least one innovative activity during the period July 1993 to June 1994. Overall, more businesses undertook non-technological innovation than technological innovation (14.0% as compared with 11.5%, respectively). For the services sector in total, the statistics are almost identical.

14. The Services sectors which had the greatest degree of innovative activity were the Wholesale trade and the Cultural and recreational services subdivisions with 33.5% and 30.6% respectively. The Education sector was next highest with 26.4%. The Finance and insurance and the Retail trade subdivisions were the least innovative with 13.7% and 17.5% respectively.

15. Looking at technological innovation on its own, Communication services (20.9%), Cultural and recreational services (19.0%) and Wholesale trade (18.0%) are the subdivisions with the greatest degree of innovation, with Transport and storage (6.5%) and Finance and insurance (7.0) being the least technologically innovative. Non-technological innovation seemed to be more evenly spread across industries, although Retail trade (7.2%) was significantly lower than other industries. Wholesale trade was the most non-technological intensive of the service sector industries, although the Electricity, gas and water industry was significantly higher than again, at 45.4%, reflecting the extent to which this industry is being reorganised and corporatised in Australia.

16. In Table 2, below, businesses are classified by employment size and type of innovative activity(s) undertaken during the reference period. The data relates to all the non-manufacturing industries surveyed; similar results would be obtained only the service sector industries were included.

2 PROPORTION OF BUSINESSES UNDERTAKING INNOVATIVE ACTIVITIES¹, BY EMPLOYMENT, JUNE 1994

<i>Employment</i>	<i>Innovation type</i>		<i>Techno- logical²</i>	<i>Non-tech- nological</i>	<i>One or more</i>
	<i>Goods</i>	<i>Services</i>			
	%	%	%	%	%
Less than 5	4.2	7.7	10.0	10.1	17.0
5-9	8.1	9.1	13.0	16.6	23.8
10-19	10.0	14.6	18.7	29.2	33.3
20-49	3.9	10.0	19.5	30.6	33.6
50-99	8.8	21.5	25.7	50.5	59.4
100-199	12.7	19.7	27.6	61.1	64.4
200-499	8.6	21.7	26.4	61.3	65.6
500-999	14.9	26.3	31.5	72.9	77.1
1,000 or more	19.8	33.1	40.0	80.7	85.5
Total	5.4	8.7	11.5	14.0	20.6

¹Relates to innovation undertaken during the period July 1993 to June 1994

²Those businesses which undertook goods and/or services innovation during the period July 1993 to June 1994

17. In general, the propensity to innovate increased with the employment size of the business, ranging from 17% of businesses employing less than five persons to 86% of businesses with 1,000 or more employees. In all employment size categories more businesses undertook non-technological innovation than undertook technological innovation. In businesses with more than 20 employees the level of non-technological innovation was twice that for technological innovation. The comparable trend in the Manufacturing sector for businesses with more than 20 employees, was for the level of technological and non-technological innovation to be similar to each other, although users should be wary of making too much of this comparison due to the different survey time frames.

18. Table 3, below, shows businesses classified by employment size and type of innovation, and then cross classified by industry.

3 PROPORTION OF BUSINESSES UNDERTAKING INNOVATIVE ACTIVITIES¹, BY EMPLOYMENT AND TYPE OF INNOVATION, JUNE 1994

Selected industries	Employment size									
	<5		5-9		10-19		20-99		>99	
	Tech inn %	Non- tech inn %	Tech inn %	Non- tech inn %	Tech inn %	Non- tech inn %	Tech inn %	Non- tech inn %	Tech inn %	Non- tech inn %
Mining	8	22	7	21	18	39	14	50	10	68
Electricity, gas and water supply	22	39	-	22	-	50	22	64	30	86
Construction	8	7	6	22	15	37	6	43	22	89
Wholesale trade	16	25	18	21	29	26	20	45	38	64
Retail trade	11	1	13	12	38	38	16	41	24	64
Accommodation, cafes and restaurants	11	16	5	10	33	33	13	24	19	54
Transport and storage	4	8	13	18	1	37	19	19	21	80
Communication services	17	17	50	25	-	-	55	45	61	100
Finance and insurance	5	8	18	20	17	34	34	45	30	69
Property and business services	12	12	9	16	7	28	15	36	30	73
Education	9	16	42	42	3	4	13	34	28	43
Health and community services	7	14	20	21	5	14	14	32	35	57
Cultural and recreational services	12	10	40	26	16	33	17	25	25	47
Personal and other services	9	12	12	28	-	10	24	29	43	63
Total all selected industries	10	10	13	17	19	29	16	35	29	64

¹ Excludes Agriculture, forestry and fishing, Manufacturing and Government, administration and defence

19. The trends borne out in Tables 1 and 2 follow through into Table 3, the exception being in the Retail trade industry. In the Retail industry, the smallest employment category (<5 employees), technological innovation is far more prevalent than non-technological innovation. However, for retail businesses employing between 5 and 20 employees the level of technological and non-technological innovation is similar. Above employment size of 20, non-technological innovation is the more prominent form of innovation. Interestingly, this result in the <5 employment category would have a significant impact on the total figure for this employment size category, by inflating the level of technological innovation.

20. Care needs to be taken with interpreting this Table, however, as the estimates for the small size group, in particular, at the detailed industry level are subject to high standard errors, because of the small sample size that had to be used for the survey.

4. CONCLUSION

21. The ABS survey of innovation in selected non-manufacturing industries in Australia has demonstrated that a considerable amount of innovation occurs in these industries. It has also shown that non-manufacturing businesses have a reasonably good understanding of the concept of innovation.

22. In terms of the objectives set for the survey at the outset, the ABS has concluded that:

a) it is possible for non-manufacturing, including Services sector businesses to report whether or not they had introduced any new or substantially changed services or goods. It is apparent, however, from the list of innovations in Attachment 1 that different businesses have different ideas of what they consider to be innovations. Some of the innovations reported by asking questions in this way may not be deemed to be of great interest to policy makers.

b) the priority to be given to the surveying of particular industries depends upon whether one is more interested in technological innovation, or in all innovative activities. If the latter is the case, there is justification for surveying all industries over time. Given the small extent to which businesses in the smallest size categories undertake innovative activities, Statistical Agencies may wish to review whether there is sufficient benefit in surveying this group if survey costs are an important issue. For the smallest businesses, the innovations tend to be smaller and the economic significance of them is likely to be small.

c) As can be seen in the Tables above, there are considerably more businesses undertaking non-technological innovation in the Services sector than there is undertaking technological innovation. This implies the need for surveys to measure the extent of the phenomenon. However from this current survey, there is insufficient data to ascertain the impact of both technological and non-technological innovation on economic growth and performance.

d) The major type of technological innovation reported was service innovation occurring in 8.7% of all surveyed businesses in the selected industries. This is the same figure for the Service industries. Attachment 1 contains some examples of the type of goods and services innovations reported in the Australian survey.

The most frequently reported non-technological innovation was the Implementation of new or substantially changed corporate directions or strategies occurring in 67% of non-technologically innovative businesses, followed by Significantly changed organisational structures at 52% and Implementation of new or substantially changed corporate directions in 20% of non-technologically innovative businesses.

5. ISSUES FOR DISCUSSION

23. No separate issue for discussion have been provided in this paper. However, reader should consider this paper in conjunction with the paper titled "Innovation in the Service Industries: The Measurement Issues" by Gault and Pattinson and address the issues raised in that paper.

ATTACHMENT 1: EXAMPLES OF INNOVATIONS IN NON-MANUFACTURING UNITS

<i>ANZSIC Business type code</i>	<i>Good or service</i>	<i>Innovation description</i>
Mining		
1101 Colliery	S	Underground roadway network
1101 Black coal mining	S	Export market activity
	G	Variety of coal qualities for export
1101 Coal Mine	G	Mining by-product for commercial sale
1102 Coal Mine	S	Develop briquette burning heater
1520 Mining services	S	Replace O/S system with Australian made system
1520 Mine	S	EDI with major customers
1520 Mining services	S	Replace O/S resin system with Australian made resin system
	G	New type of mine ventilation sealing system
Electricity, Gas and Water Supply		
3610 Local government	S	Change of name and location as part of commercialisation
3610 State government	G	New techniques for integrated drying and gasification of brown coal
3610 Local government	S	Guaranteed levels of service to customers
3702 City council	S	New customer service centre - "One stop shop" approach
Construction		
4121 Roads corporation	S	Outsourced internal services
4122 Construction	S	Outsourced maintenance contract
4122 Construction	S	Site remediation (cleanup)
Wholesale trade		
4512 Grain Board	S	Opened international office
4519 Hardware Store	S	Introduced active selling verses passive selling
4521 Petroleum Products	G	Introduced new grades of lubricants
4522 Metal Wholesaler	S	Introduced "service charter" to improve level of service
	G	New type of pipes and house frames
4522 Wholesaler	S	EDI
4522 Metal & mineral	S	New mainframe software
	G	Stainless steel flat bar from coil
4522 Metal w/saler	S	Technical documentation and hot-line
	G	Printers
4523 Chemical Wholesaler	G	New range of cleaning products
4523 Chemical w/saler	G	New industrial vacuum cleaner
4611 Farm equipment	G	New heads for sprayer
4611 Construct. Equip.	S	New maintenance Schedule
	G	New range of road roller equipment
4613 Computer Services	S	Introduced new maintenance offerings
4613 Computer Wholesaler	S	Introduced new maintenance offerings

4614	Business machine	G	New model of hardware and software
		S	Disaster recovery system
		G	New transmission equipment
4615	Electronics w/sale	G	Software modifying communication with equipment
4615	Welder	G	Increased capacity of welding machines
4615	Electrical Wholes.	G	New range of goods
4615	Electrical Wholes	G	Introduced new products
4615	Software	S	Introduced third party maintenance
4619	Printing Equipment	G	New range of equipment which eliminates hazardous chemical
4619	Aircraft wholesaler	G	Regional airline sales
4623	Motor vehicle		
	new parts	G	Hydraulic hose and fittings
4711	Meat wholesaler		New direct customer strategic alliance
4719	Grocery Whole.	G	New packaging of products
4719	Grocery w/saler	G	Flavour bases
4722	Clothing Co	S	New staff dedicated to marketing special range of goods
4793	Sport Goods Whole.	G	New inline and ice hockey equipment
4794	Book Wholesaler	S	Introduced customer strategic alliances
4794	Graphic		Introduced customer strategic alliances
4795	Paper prod w/saler	S	Relocate manufacturing - reduce lead time
		G	New type of boarding pass
4795	Stationery w/saler	G	New product lines
4799	Steel shelving	S	Installed computer system

Retail Trade

5110	Supermarket	S	Superstore
5125	Fast-food outlet	S	Home delivery testing
5210	Department store	G	Increase/change product range
5221	Clothing store	S	Suit hire
5223	Retail	G	Introduced gift vouchers
5234	Electrical Outlet	S	Increased customer focus especially more timely delivery
5234	Domestic Appliance	G	Generic brand product range
5242	Toy retailing	S	Toy superstores
		G	Range of toys not previously available in Australia
5244	Photographer	S	Opened longer hours
5311	Car Dealer	S	Provide customer breakdown training in basic mechanical skills
5321	Fuel retailer	S	Fresh baked bread
5323	Smash repairer	S	Smash repairs and mechanical repairs
		G	New wheel alignment machine
5323	Smash Repairers	S	Hire car scheme for clients
5329	Automotive repair	S	Quality assurance program

Accommodation, Cafes and Restaurants

5710	Accommodation	S	Outlet for wood fired pizzas
5730	Takeaway food	S	"All you can eat deal"

Transport and Storage

6110	Transport Co.	S	Opened distribution service
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6110	Road freight	S	Quality accredited - streamlined service
6121	Coach co.	S	New coach for extended tours
6122	Bus co.	S	Local area high frequency minibus service
6301	Transport Co.	S	EDI and EFT
6301	Internat. Sea Tran.	S	EDI and EFT
6302	Tour Operator	S	Introduction of pontoons for reef trip
6302	Coastal water	S	Dredging and rock placement activities
6302	Coastal Water Tran.	S	Introduction of pontoons for reef trip
6403	Aircraft charter	G	Introduced new type of aircraft for greater uplift and efficiency
6629	Port Authority	S	New cargo handling equipment
6629	Maritime board	S	Central vessel booking service
6630	Aircraft refueller	S	Introduced one person refuelling
6641	Travel agency	S	New automation systems
		G	New program for Indochina
6641	Travel agency	S	Introduced facsimile service from airport
6641	Airline	S	New international flight path
6642	Transport Co	S	Introduced continuous vehicle operations
6643	Freight forwarding	S	Client interface technology
6709		S	Increased personal service in technical areas i.e. printed technical sheet

Communication Services

7112	Courier	G	Prepaid air freight satchels
7112	Courier	S	Introduced twice daily deliveries
7120	Telecommunication	S	Shifted from sales to repair of equipment

Finance and Insurance

7321	Bank	S	Introduced mobile sales team
7321	Bank	S	New type of commercial loans
7330		S	Ceased public advertising and switched to bank client database
7330	Credit group	S	On-line system to control ceased assets at customers' site of operations
7330	Credit Card	G	Changed statement size
7330	Insurance	S	Insurance premium financing
7330	Other Financier	S	Changed statement size
7330	Other Financier	S	Insurance premium financing
7340	Printer	S	Document scanning service
7340	Courier	G	Introduced tri-axle trailers to provide long haul services
7340	Food distributor	S	Increased efficiency of milk distribution
7340	Finance investors	G	Concrete lifting hardware and construction tools
7340	Construction	S	Entered environmental concrete crushing
		G	New masonry blocks
7411	Life insurance	S	Customer access to internal systems
7411	Life insurance	S	Retail shopfront customer servicing
		G	New superannuation and investment product
7422	Insurance	S	Introduced direct debit monthly premiums
7422	Insurance	S	Introduced after hours claim service
7422	Insurance	S	Interstate sales of insurance
7422	Insurance	S	Industry newsletter
7519	Manchester		

	franchise	G	Introduced customised/personalised quilts
		S	Established a client research library
7519	Insurance	S	Financial planning
7519	Finance Co.	S	Redesigning client service system
7519	Services to Finance	S	Established a client research library
7520	Superannuation fund	S	Upgraded computer to enhance level of service
7520	Insurance services	S	Administer super fund
7520	Services to Insur.	G	New allocated pension products

Property and Business Services

7712	Fencer	S	Introduced GPS to assist in fencing in hilly country
7720	Real estate agents	S	Better property management
7730	Non Financial Asset	G	New product line
7741	Car rental	S	Japanese HELP DESK
7743	Excavation Co	S	Pilot tested new gold heap leaching technology
7829	Communication	S	Numeric paging service with voice prompting
7829	Technical services	G	Cattle tick vaccine
7829	Technical services	G	Robotic inspection and packaging line
7829	Technology service	S	On-line process analysis support
7833	IT Maintenance	S	Introduced 3rd party maintenance
		G	Self service facility
7834	Computer consultant	S	OCR scanning and image capture
7851	Advertising agency	S	Crisis management consultancy
7854	Building Supplier	S	EDI
7854	Business admin	S	Bulk shipping services
		G	New yoghurt and yeast cultures
7855	Hotel	S	Aboriginal cultural tours
		G	Resort logo retail outlets
7862	Contract Staff	S	Practically based industry training delivery
7864	Security	S	Provide detailed client information in respect of cash counted

Education

8423	School	S	Self checkout system for library
8423	School	S	Satellite language programs from Asia
8423	School	S	Classes for accelerated learning and for intellectually handicapped children
8440	College	S	Introduced employment placement service for disabled people
8440	College	S	Introduced laptops for grade 7 students

Health and Community Services

8611	Hospital	S	- Quality control - admissions, theatre queues
8611	Health	S	Specialised radiology service
8611	Hospital	S	Bone marrow transplant program
8611	Hospital	G	Day surgery
8613	Nursing home	S	Delivery of services to homes
8621	General practice	S	Collection of scripts by local pharmacies
		G	Dressing techniques for ulcer treatment
8631	Pathology lab	S	Quality assurance program
8639	Charity	S	Recycled clothing service
8639	Health services	S	Visit senior citizens and hostels
8639	Health Service	S	Recycled clothing service

		G	Introduced resuscitation face mask
8640	Vet	S	Introduced cataract extraction with lens replacement
8640	Vet	S	Provide worm monitoring service
8640	Vet	S	New computer package
8710	Kindergarten	S	Vacation care plan-daily bus excursions
8721	Aged care home	S	Residence for disturbed adolescents
8722	Health service	S	Parent accommodation (accompanying child)
8729	Student Association	S	Free coffee bar
8729	Health Foundation	S	Set-up Advise/health line
8729	Charity	S	No interest loans - low income people
8729	Support group	S	24 hour phone contact with member
		G	Software program
8729	Health Foundation	S	Increased availability of advise line

Cultural and Recreational Services

9210	Regional library	S	On-line searching via Internet
9239	Tourist attraction	S	Modified entry system to make it more efficient and user friendly
9239	Tourist attraction	S	Introduced guided tours
9242	Creative arts	G	New video and CD
9259	Services to Arts	S	PA hire and wedding videos
9311	Horse & dog racing	S	Function centre
9329	Gambling agency	S	Changed over to electronic dissemination
9329	Gambling services	G	Introduced new gaming machines
9330	Equestrian academy	S	Import frozen horse semen for breeding

Personal and Other Services

9521	Laundry	G	Introduced disposable hand towels
9523	Photographer	S	Digital imaging
		G	Digital photographs
9526	Shop	S	Introduced body piercing
9526	Hairdresser	S	Using new range of products on clients
9526	Hairdresser	G	Diet powder
9527	Hairdresser	S	Retail refill system
9629	Car Association	S	Monitored home security services
9629	Car Association	S	Home loan service
9629	Car Association	S	Home loan service and mobile sales team
9634	Waste Management	S	Provide grease trap treatment plant

Small Business and Science and Technology Section
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