CHAPTER-IV

RESULTS AND DISCUSSIONS
4.1 Introduction

This chapter portrays the summary results and discussions of the study on “Innovation Management in Small and Medium Enterprises”.

4.2 Demographic characteristics of the Respondents

- The rate of response of SMEs is 49% (i.e. 677/1380). In this small scale industries are 53.7% (i.e. 618/1150) and medium scale industries are 25.6% (i.e. 59/230) and the total response of SMEs consist of 80.2% (i.e. 534/677) manufacturing and 19.8% (i.e. 134/677) service firms.

- 83% of the medium scale firms possess below 15 years of experience and 17% of medium firms have above 15 years of experience. 86.4% of the small firms possess below 15 years of experience and 13.6% of small firms have above 15 years of experience. 84.7% of the manufacturing firms possess below 15 years of experience and 15.3% of manufacturing firms have above 15 years experience. 91.7% of the service firms possess below 15 years of experience and 8.3% of service firms have above 15 years of experience.

- In manufacturing sector the firms belong to Food products (17.88%), hardware (13.74%), granite slabs (13.29%), metal works (9.30%), Plastic goods (7.83%), textiles (7.10%), electrical works (5.17%), and chemicals (3.98%), wood works (1.92%) business.

- In Service sector the firms are related to Business services (10.34%), Automobile services (6.65%), and IT services (2.82%).

- The minimum year of experience of the manufacturing firms is 3 years and maximum years are 65. The minimum years of experience of the service firms is 5 years and maximum years is 37. The minimum years of experience of the medium scale firms is 5 years and maximum years is 37. The minimum years of experience of the small scale firms is 3 years and maximum years is 65.

- The minimum production capacity of the manufacturing firm is 2.0 lakhs and maximum production is 4000 lakhs. The minimum production capacity of the
service firm is 2.28 lakhs and maximum production is 200 lakhs. The minimum production capacity of the medium scale firm is 2.89 lakhs and maximum production capacity is 400 lakhs. The minimum production capacity of the small scale firm is 2.0 lakhs and maximum production capacity is 4000 lakhs.

- The minimum sales of the manufacturing firms is 1.5 lakhs and maximum sales is 3750 lakhs. The minimum sales of the service firms is 2.0 lakhs and maximum sales is 180 lakhs. The minimum sales of the medium scale firms is 1.89 lakhs and maximum sales is 386 lakhs. The minimum sales of the small scale firms is 1.5 lakhs and maximum sales is 3750 lakhs.

4.2.1: The performance of SMEs (Table 3.7 to 3.9)

- Table 3.7 result says that there exists impact of innovation on firm performance. Two proxies were used to capture firm performance. The table was constructed using the number and proportion of firms that indicated an increase in their employment and sales. Most of the innovative firms had seen improvements in their performance (i.e., employment is increased by 20.4% and sales were increased by 75.9% in SMEs).

- Tables 3.8 and 3.9 reveals that innovation influences the small and medium firm performances and manufacturing and service firm performance. Two proxies were used to capture firm performance. Most of the innovative firms had seen improvements in their performance. Employment is increased by 15.2% and sales were increased by 81.3% in medium firms, employment is increased by 20.9% and sales were increased by 75.4% in small firms, employment is increased by 19.3% and sales were increased by 74.4% in manufacturing firms and employment is increased by 24.6% and sales were increased by 82% in service firms.

4.3 Innovation strategies deployment in SMEs

All the companies are showing attention to innovation and they are practicing innovation policies such as investment in new projects, patents development, collaboration with external technology, new product development, using outside consultancy, seeking employee suggestions, customer suggestion, and supplier
4.3.1: **Deployment of open innovation practices in manufacturing and service companies according to their nature of business (Tables 3.10 and 3.11)**

- New product development, seeking customer suggestions, seeking supplier suggestions, investment in new projects, and sharing of knowledge are showing good response in granite companies. Seeking employee suggestions is moderate and patents development, collaboration with external technology, using outside consultancy, outsourced R&D projects, and investments in R&D are very poor in the granite companies.

- Seeking customer suggestions, seeking supplier suggestions, seeking employee suggestions, and sharing of knowledge is good, new product development is moderate, investment in new projects, outsourced R&D projects, investment in R&D, using outside consultancy, collaboration with external technology is very poor, and patents development is nil in food products.

- New product development, seeking supplier suggestions, seeking customer suggestions, sharing of knowledge and seeking employee suggestions is good, and investment in new projects, patents development, collaboration with external technology, using outside consultancy, outsourced R&D projects, and investment in R&D is very poor in metal works.

- New product development and sharing of knowledge is good, seeking customer suggestions, seeking supplier suggestions, seeking employee suggestions, and investment in new projects is moderate, and using outside consultancy, investment in R&D, outsourced R&D projects, collaboration with external technology, and patents development is poor in hardware works.

- Sharing of knowledge is good, new product development, seeking customer suggestions, seeking supplier suggestions, and seeking employee suggestions is moderate, using outside consultancy, investment in R&D, and patents
development is very poor, and collaboration with external technology, and outsourced R&D projects is nil in electrical works.

- Sharing of knowledge, seeking customer suggestions, seeking supplier suggestions, and new product development is good, seeking employee suggestions, and investment in new projects is moderate, investment in R&D, outsourced R&D projects, using outside consultancy, and patents development is very poor, and collaboration with external technology is nil in plastic companies.

- Seeking supplier suggestions, seeking customer suggestions, new product development, seeking employee suggestions, and sharing of knowledge is good, investment in new projects is moderate, and patents development, collaboration with external technology, using outside consultancy, outsourced R&D projects, and investment in R&D is nil in wood works.

- Sharing of knowledge, new product development, seeking customer suggestions, seeking supplier suggestions, and seeking employee suggestions is good, investments in new projects is moderate, patents development, and collaboration with external technology is very poor, and using outside consultancy, outsourced R&D projects, and investment in R&D is nil in textile companies.

- Sharing of knowledge is good, new product development, seeking employee suggestions, seeking customer suggestions, seeking supplier suggestions, and investment in new projects is moderate, and investment in R&D, outsourced R&D projects, using outside consultancy, collaboration with external technology, and patents development is poor in chemical companies.

- New product development, sharing of knowledge, seeking supplier suggestions, seeking customer suggestions, seeking employee suggestions, and collaboration with external technology is very good, moderate in investment in new projects, patents development, using outside consultancy is very poor, and outsourced R&D projects, and investment in R&D is nil in IT services.

- New product development, investment in new projects, seeking customer suggestions, sharing of knowledge is good, seeking employee suggestions, and
seeking supplier suggestions is moderate, collaboration with external technology, using outside consultancy, outsourced R&D projects, and investment in R&D is very poor, and patents development is nil in business services.

- New product development, and sharing of knowledge is good, seeking employee suggestions, and seeking customer suggestions is moderate, and investment in new projects, patents development, collaboration with external technology, using outside consultancy, outsourced R&D projects, and investment in R&D is very poor in automobile services.

4.3.2: **SMEs involvements open innovation practices and the perceptual change of these practices during 2001-2007 (Table 3.12 to 3.16)**

- New product development, sharing of knowledge, seeking supplier suggestions, seeking customer suggestions, and seeking employee suggestions is fairly common among SMEs in Andhra Pradesh. The most striking result is that the percentage of respondents who perceive an intensification of the use of open innovation practices substantially larger. Most of the indicators like new product development, sharing of knowledge, seeking supplier suggestions, seeking customer suggestions, and seeking employee suggestions are popularly used in the years 2001-2007. Remaining indicators like investment in new projects, patents development, collaboration with external technology, using outside consultancy, outsourced R&D projects, and investment in R&D are moderately used in all SMEs of AP during the study period i.e. 2001-2007. Regarding open innovation practices the present survey supports the findings of Van de Vrande, V., et. al., (2008)\(^1\) which was indicated that open innovation is also becoming increasingly popular among SMEs. This is not a surprising, considering the important role of small and medium sized firms play in innovation. Small firms often lack resources to develop and commercialize new product in-house and as a result are more often inclined to collaborate with large, firms. The study tells that the open innovation system exists among Andhra Pradesh SMEs.
4.3.3: Open innovation practices among manufacturing and service firms

(Table 3.17)

- Seeking customer suggestions, seeking supplier suggestions, seeking employee suggestions, new product development, sharing of knowledge, outsourced R&D projects, and investment in new projects appear to be the open innovation practices used by manufacturing firms. New product development, sharing of knowledge, seeking customer suggestions, seeking employee suggestions, collaboration with external technology, seeking supplier suggestions, and patents development appear to be the main types of open innovation practices used by the service firms. One-way analysis of variance furthermore demonstrates that outsourced R&D projects, using outside consultancy and seeking customer suggestions are more frequently used strategies by manufacturing firms than service firms. Thus, the results do show no difference between manufacturing firms and service firms in practice of open innovation except using outside consultancy, seeking customer suggestions and outsourced R&D projects.

- Respondents from both manufacturing and service companies indicate that on an average open innovation practices have been increasingly used during 2001-2007 years (as mean scores are positive for both types of firms). One-way analysis of variance furthermore shows that service firms have experienced a stronger shift towards more outsourced R&D projects. There is no statistical difference between the manufacturing and service enterprises regarding deployment of open innovation practices. This supports the findings of Van de Vrande, V., (2008)\(^{(1)}\) Manufacturing firms on an average more active in the outsourcing of R&D and registration of patent for intellectual property, than service enterprises but they do not differ in other practices of open innovation.

4.3.4: Open innovation practices among medium and small firms (Table 3.18)

- Patents development, collaboration with external technology, seeking customer suggestions, seeking employee suggestions, new product
development, sharing of knowledge, and seeking supplier suggestions appear
to be the main types of open innovation practices used by medium firms.
Seeking customer suggestions, seeking supplier suggestions, seeking
employee suggestions, new product development, sharing of knowledge, and
investment in new projects appear to be the main types of open innovation
practices used by the small firms. One-way analysis of variance furthermore
demonstrates that no difference between medium and small firms in usage of
open innovation practices.

- Respondents from both medium and small firms indicate that on an average
open innovation practices have been increasingly used during 2001-2007 years
(as mean scores are positive for both types of firms). One-way analysis of
variance furthermore shows that there is no statistical difference between the
medium and service firms.

4.3.5: The distribution of clusters among SMEs according to the nature of
business (Tables 3.19 to 3.22)

- Cluster analysis divides SMEs into two clusters. Cluster 1 consists of 374
companies (55.2%) and cluster 2 consists of 303 companies (44.8%).

- Firms in Cluster 1 are more innovative than cluster 2 as more than 50% of
firms in cluster 1 are involved in new product development, seeking employee
suggestions, seeking customer suggestions, seeking supplier suggestions and
sharing of knowledge.

- Cluster 1 consists of 308 manufacturing firms i.e. 82.3% and 66 service firms
i.e. 17.7%. Cluster 2 consists of 235 manufacturing firms i.e. 77.55% and 68
service firms i.e. 22.45%

- Cluster 1 consists of 35 medium firms i.e. 9.36% and 339 small firms i.e.
90.64%. Cluster 2 consists of 24 medium firms i.e. 7.92% and 279 small firms
i.e. 90.64%.

- Majority of the firms of granites, food products, metal works, plastic, wood
works, textiles, IT services and automobile services are strongly involved in
usage of open innovation practices in cluster 1.

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Majority of hardware, electrical works, chemicals, and business services firms are more innovative firms than other firms in cluster 2.

4.3.6: Open innovation practices across two clusters (Table 3.23)

Firms in cluster 1 are strongly involved in seeking customer suggestions, seeking supplier suggestions, seeking employee suggestions, new product development, sharing of knowledge, and investment in new projects of open innovation practices. They use the above set of practices to improve their innovation performance when compared to cluster 2. Cluster 2 includes innovative firms that only rely on new product development, and sharing of knowledge. One-way analysis of variance furthermore demonstrates that cluster 1 and cluster 2 differs in practising collaboration with external technology, new product development, seeking employee suggestions, seeking customer suggestions, seeking supplier suggestions, and sharing of knowledge.

4.4 Exploration of innovation culture among SMEs

Tables 3.24 to 3.26 contain information about the innovation culture of the firms. The tables show the incidence of each type of innovation that is evident among the SMEs, in the period 2001-2007. At first glance, a higher incidence of product innovation is to be seen. This is not surprising because in many instances, changes made to organisations processes-especially if the changes are in the production processes – do actually give rise to innovative changes in products.

The results of the (table 3.27) Wilcoxon test tells SMEs focus on product innovation than process innovation is found significantly exist (Z = -7.390; p< 0.05). Thus H2 (a) was therefore accepted. This finding supports that earlier studies that indicate a higher focus on product innovations (e.g., Oke et al, 2004)[2], is not counter-intuitive, especially within the developing country context. Similarly the figures suggest a greater focus on incremental innovation than radical innovation. Thus H2 (b) was accepted. This finding
supports Bala-Subramanya, (2006) SMEs therein would focus on incremental innovations.

- The results of the small firms (table 3.28) Wilcoxon test reveals the focus on product than process innovation is found to be significant ($Z = -7.299; p < 0.05$). Thus H2 (a1) was therefore accepted. Similarly Wilcoxon on test suggests a greater focus on incremental innovation than radical innovation. Thus H2(b1) was accepted.

- The results of the medium firms (table 3.29) Wilcoxon on test reveals the focus on product than process innovation is found not to be significant ($Z = -1.291; p > 0.05$). H2 (a2) was therefore rejected. Wilcoxon on test also suggests a greater focus on incremental innovation than radical innovation. Thus H2(b2) was accepted.

- The results of the manufacturing firms (table 3.33) Wilcoxon on test reveals the focus on product than process innovation is found to be significant ($Z = -6.60; p < 0.05$). H2 (a3) was therefore accepted. Similarly Wilcoxon on test suggests greater focus on incremental innovation than radical innovation in manufacturing firms. Thus H2(b3) was accepted.

- The results of the service firms (table 3.31) Wilcoxon on test reveals the focus on product than process innovation is found to be significant ($Z = -3.244; p < 0.05$). H2 (a4) was therefore accepted. Similarly Wilcoxon on test suggests a greater focus on incremental innovation than radical innovation. Thus H2 (b4) was accepted.

It is important to note that the results here suggest that while SMEs in developing countries are concentrating on product than process innovations, they seem to be more inclined towards innovations of incremental nature, be it product- or process-related. This is consistent with findings from other studies in the context of developing countries. For instance, Goedhuys (2007) showed, with evidence from Brazil, that minor and incremental rather than radical changes are at the heart of the innovation process in developing countries.
4.4.1: Firm characteristics improvements association with the type of innovation (Table 3.35 to 3.39)

- Regression test reveals that sales and production capacity have significant impact on the focus of innovations by SMEs and employment, and experience does not have significant impact on the focus of innovation (table 3.35). Thus H3 (a), H3 (c) are rejected and H3 (b), H3 (d) are accepted.

- Regression test reveals that sales and production capacity have significant impact on the focus of innovations by small firms and employment, and experience does not have significant impact on the focus of innovation (table 3.36). So H3 (a1), H3 (c1) are rejected and H3 (b1), H3 (d1) are accepted.

- Regression test reveals that sales and experience have significant impact on the focus of innovations by medium firms and employment, and production capacity does not have significant impact on the focus of innovation (table 3.37). Therefore H3 (a2), H3 (d2) are rejected and H3 (b2), H3 (c2) are accepted.

- Regression test reveals that sales and production capacity have significant impact on the focus of innovations by manufacturing firms and employment, and experience does not have significant impact on the focus of innovation (table 3.38). So H3 (a3), H3 (c3) are rejected and H3 (b3), H3 (d3) are accepted.

- Regression test reveals that sales, employment, and production capacity does not have significant impact on the focus of innovations by service firms and experience has significant impact on the focus of innovation (3.39). Thus H3 (a4), H3 (b4), H3 (c4) are accepted and H3 (d4) is rejected.

4.4.2: Exploitation of dependency of firm characteristics on the degree of novelty of the innovations among SMEs (Tables 3.40 to 3.44)

- The results of (tables 3.40, 3.41, 3.43, and 3.44) regression with the degree of novelty of the innovations leads to the findings that novelty of innovation does
not have a significant dependency on firms characteristics like sales, employment, production capacity, and experience in SMEs, small, manufacturing, and service firms. Thus H4 (a, b, c, d), H4 (a1, b1, c1, d1), H4 (a3, b3, c3, d3), and H4 (a4, b4, c4, d4) are accepted.

The results of (table 3.42) regression analysis of medium firms with the degree of novelty of the innovation spells that there is an influence of experience on the novelty of innovation and sales, employment and production capacity do not have significant dependence on novelty of innovation. Thus H4 (d2) is rejected and H4 (a2), H4 (b2), H4 (c2) are accepted. This makes a lot of sense as most SMEs are likely to fail in their radical innovation efforts due to the prevailing systemic and internal constraints that they are confounded with.

The apparent dependency of novelty of innovation on firm characteristics like sales, employment, and production capacity seems to be counter-intuitive and opposed to the literature (Bala-Subrahmanya, 2006[3]; Ilori et al., 2000[4]; Goedhuys, 2007[5]). However, the point to be noted is that results do not suggest that innovation, in itself, is not important to firms improved performance. Rather, the results indicate that in the developing country like Indian SMEs that do not generally have a luxury of choice that is why the firm chooses to pursue such innovations that most fit its strategies and available resources. Nevertheless, it is apparent that the pursuit of innovations is preferred by SMEs in AP.
Reference


