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National Centre for Technology Management, Inderscience Publishers

2009

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Abstract

Understanding the types of innovations that SMEs currently undertake, and their commitment to innovation, is especially useful for policy making in developing countries. This paper, therefore, addressed two main questions: What types of innovation occur in SMEs? How intense is innovation in SMEs? We have used empirical information from a census carried out in the Nigerian Cable and Wire manufacturing industry. Questionnaire and interviews were the primary means of data collection and the data covered the 4-year period between 2003 and 2007. We found a high prevalence of organisational innovation and low prevalence of diffusion-based innovation. Innovation intensity was low at 0.114% per capita training investment. Interestingly, our findings revealed that process and marketing innovation accompanied each other. We conclude that SMEs in developing countries are not innovation-inactive and that they would do better if industries are well organised and firms make higher investments in learning and capability build-up.

Keywords*: types of innovation; innovation intensity; SMEs; Nigeria; manufacturing; Cable & Wire*

1. Introduction

Microenterprises and SMEs are acknowledged to be the emerging private sector in poor countries, and thus form the base for private sector-led growth (Hallberg, 2000). Particularly developing country governments should be interested in microenterprises and SMEs because they account for a large share of firms and employment (Little et al, 1987). At the beginning of this decade, about 10% of total manufacturing output and 70% of industrial employment are acclaimed to be by SMEs in Nigeria (Carpenter, 2001). Some of these SMEs actually evolve, as countries develop and the economy matures, to become large enterprises. Therefore, SME development is imperative to a country's growth, if it would not remains dependent on multi-national corporations to drive the industrial sector.

Consequently, stimulating and sustaining the growth of SMEs has been a key issue of interest in Nigeria, the centre point of which is the Small and Medium Enterprise

Development Agency of Nigeria (SMEDAN). However, contrary to the situation in advanced economies like the United Kingdom (Bala-Subrahmanya, 2001), the Nigerian approach to SME development does not seem to sufficiently focus on funding research collaboration and promoting technological innovation efforts. Rather, the provision of risk-free capital is at the heart of SME support mechanisms in the country; and the policy framework for the support of SMEs is still largely immature (Oyefuga et al, 2008).

The economic environment in which SMEs in Nigeria operate is characterised by several challenges which collectively impact negatively on the costs and productivity (and hence the competitiveness) of the SMEs (Oyefuga et al, 2008), particularly the ones in manufacturing. Coupled with the effects of globalisation, the Nigerian SME has come under a lot of competitive pressure coming especially from firms that are situated within more favourable contexts. It then follows that while funding schemes are beneficial in their own way (Oyefuga et al, 2008), they are definitely not sufficient to stimulate or sustain the competitiveness of small businesses. A major way through which a firm acquires and improves competitiveness is innovation (Uvaliyev, 2006; Keizer et al, 2005; Bala-Subrahmanya, 2005a), the geographical context notwithstanding. Thus, understanding the types of innovations that SMEs currently undertake, and how committed they are to these, is useful for the purpose of policies targeted at competitiveness in developing countries. This is particularly useful because detailed micro-level knowledge available on innovation is still limited (Srholec, 2008), more so in the context of SMEs in developing countries.

This paper addresses two main questions: What types of innovation occur in SMEs in a developing country? How intense are the innovation efforts of these SMEs? Answers to these questions are sought from the Cable and Wire manufacturing sub-sector in Nigeria. In spite of the difficult economic conditions in Nigeria, firms in the Cable and Wire manufacturing industry are reputed to have world-class products. In fact, the sub-sector is one of the very few in Nigeria that have large market clout, not only in Nigeria but also in West Africa. Very low capacity utilisation is prevalent in the industrial sector as a whole but the Cable and Wire manufacturing firms have consistently shown high capacity utilisation relative to the entire domestic industrial sector. Thus, they represent a useful set of extreme cases whose characteristics have positive policy potentials if properly understood.

The paper is divided into five sections including this introduction. The next section presents a brief review of the most relevant concepts and literature just sufficient to bring out the key issues Section 3 discusses the methodology while Section 4 details the empirical findings. The paper concludes in Section 5, drawing policy lessons and suggestions for future studies.

2. Innovation in SMEs: a brief review of the literature

The statistical definition of SMEs varies by country, and is commonly based on the number of employees, the value of assets or turnover or a combination of these (Atkins and Lowe, 1997; Hallberg, 2000). The lower limit for small-scale enterprises is usually set at 5 to 10 workers and the upper limit at 50 to 100 workers; while the upper limit for "medium-scale" enterprises is usually set between 100 and 250 employees, depending on

the size of the economy (Hallberg, 2000). For instance, the United States Small Business Administration (SBA) set the upper-limit size standards at 500 employees for most manufacturing and mining industries (US Small Business Administration, 2009). In the European Union, a medium enterprise is one that employ up to 250 people (Commission Recommendation, 2003). For Nigeria, the upper limits of employment and assets in SMEs should be 100 and 500 million naira (about 571000 – 2 million USD)[1] respectively (Ramachandran, 2002; Oyefuga et al, 2008). Thus, a small scale enterprise in the United States may be a large enterprise or a very large enterprise in some African countries.

However they are defined, it has been consistently argued that small and medium-sized enterprises (SMEs) play significant roles in national competitiveness, mostly because of their ubiquitous nature and high employment generation potentials. For instance, in 1996 in Japan, 98.8% percent of establishments in the non-primary sector were SMEs, and 77.6% of workers were employed by SMEs. In the United States, small businesses create two-thirds of the new jobs, produce 39% of the gross national product (GNP), and generate more than half of the technological innovation. In Europe, 99.8% of the firms are SMEs, responsible for two-thirds of the turnover and business employment. In Spain, SMEs generate 70% of the employment (Urata and Kawai, 2001; Bruque and Moyano, 2007; Kuan and Chau, 2001; European Commission, 2005; Carayannis et al., 2006). In Nigeria, SMEs account for 87% of all firms, excluding the informal sector (Ramachandran, 2002). Thus, understanding how to optimize the innovation performance of these enterprises will go a long way in driving national competitiveness.

The literature on typologies of innovation is extensive and quite ubiquitous, thus we would not attempt another review here. Actually, a number of review articles have been published[2], one of the most recent of which is Popadiuk's and Choo's (2006) excellent systematic review of the literature on innovation types. From them we learn that product and process innovations are sub-sets of technological innovation which can further be resolved into radical or incremental, depending on the degree of novelty (see also García-Muiña and Navas-López, 2007; OECD, 2005; Hadjimanolis, 2003; Souitaris, 2003; Tushman and Anderson, 1986).

Prior research has identified certain specific characteristics of innovation in SMEs. In India, Bala-Subrahmanya (2006) reported that SMEs, irrespective of size, are primarily engaged in 'incremental technological innovations' with self efforts. He found that average innovation expenditure and innovation personnel increased with firm size, that there was a positive relationship between innovation expenditure and value of output, and that a negative relationship existed between innovation intensity and firm size. Buratti and Penco (2001) found that the innovation capability of Italian SMEs, particularly firms operating in mature and fragmented sectors, was accompanied by many weaknesses in technological development. These revolved around inability of entrepreneurs to manage technology as a strategic weapon, limited human resources available for internal implementation of new external technologies and weak financial standing which prevented any risk taking by SMEs. Indeed, many SMEs seem to fail to innovate in time, because they seem to be locked in a vicious circle of being fully occupied with solving short-term operational problems and dire resource constraints (Bessant, 2003; Tidd *et al.*, 2005). In spite of so much studies that have been carried out

[1] 1 naira = 175 USD, March 2009 (www.xe.com)
[2] see for instance Hoffman et al, 1998 and Becheikh et al, 2006

on innovation in SMEs (Keizer et al, 2002), micro data on innovation is still extremely scarce in developing countries (Srholec, 2008). It remains to be fully understood, for instance, whether or not certain types of innovation are more prevalent than others. Knowledge about intensity of innovation is also limited, all the more in developing countries.

3. Research Methods

3.1 Data and Sampling

This study uses data from a census of the Cable and Wire manufacturing firms in Nigeria. Although up to 26 firms were reported by MAN (2007), only the firms that belonged to the Cable Manufacturers Association of Nigeria (CAMAN) were included in the study. CAMAN is the industry association comprising the 11 major firms that manufacture electrical and telecommunications cables in Nigeria presently.

Data were collected between September 2007 and January 2008 from the firms through the use of a structured questionnaire administered on the four departments identified as relevant to this study (Administration/Human Resource; Production, Engineering/Maintenance and Marketing Departments). Questionnaire was administered on a senior, functional level and line manager in each department. This approach was used in order to capture departmental nuances, should there be any in the firms' innovation efforts, and to minimise loss of questionnaire and enhance response rate. A total of 132 questionnaire was thus administered. Altogether, 73% useful completed questionnaire which included at least 2 returns from every firm was obtained. The averages of the responses from each department were used as the representative response for the department. These were then normalised to yield single firm-level responses that were finally used as the basis of analysis.

3.2 Variables and Measure

In our measurement of innovation, we considered 5 types of innovation. The variables and the approach to their measurement were based largely on UNU-INTECH (2004). Product innovation was measured via three proxy variables, the first of which is similar to those used in many previous studies (Romijn and Albaladejo, 2002; OECD, 1992; Pavitt, 1985; Patel and Pavitt, 2005; Archibugi and Pianta, 1996; Basberg, 1987 and Griliches, 1990). The next two variables measured whether or not the firm introduced a new product to the market or modified an existing one. The sum of all the scores made up the product innovation index (ProdInn). Process innovation was measured with two variables indicating whether or not the firm introduced a new process in its production activities or modified an existing one (UNU-INTECH, 2004; Romijn and Albaladejo, 2002). Process innovation index (ProcInn) was the sum of the scores on these variables. Organisational innovation was captured with six variables drawn from UNU-INTECH (2004): changes in management routine; quality controls; maintenance routines; plant layout and waste management procedures; and the introduction of new in-house training programmes. The organisational innovation index (OrgInn) was the sum of the scores on these variables. Marketing innovation was measured through three variables that indicated whether or not the firm developed a new market; (local or foreign) or

introduced a new marketing technique. These variables were adopted from UNU-INTECH (2004) and the marketing innovation index (MarkInn) was made up of the sum of their scores. Diffusion-based innovation is considered to be unique in the sense that it captures technology transfer activities which are particularly important in the developing country context where innovation dwells greatly on diffusion of technology (Polcuch *et al.*, 2005; Srholec, 2008). This innovation type was measured through three simple binary variables: purchase of new equipment (either locally or imported) and the acquisition of product licence or process licence. Whether or not a firm uses technology licensed from a foreign owned company or enters into a joint venture has been found to be important for firm growth (Goedhuys, 2007). An index (DiffInn) was also constructed as the sum of the scores on the component variables. The highest attainable score was 2 because no information was obtained on equipment purchase, thus it was excluded from the final analyses.

3.2 Data Treatment

Each of the indices constructed as outlined above served as indicators of whether or not a firm was innovation-active or not. Following the Oslo Manual (OECD, 2005), a firm was classified in this study as innovative irrespective of whether activities had become successful or not. The non-zero innovation indices were re-coded as 1 to enable certain types of analyses involving the innovation types. The types of innovation among the firms were examined by the prevalence of the different innovation types among the firms. The intensity of innovations was evaluated using the innovation indices (breadth of the firms' innovation efforts) as well as innovation investment and training expenditure as percentage of firm revenue (Goedhuys et al, 2006; Bala-Subrahmanya, 2005a; Garcia-Torres and Hollanders, 2009) as far as the available data would permit.

4. Results and Discussion

4.1 Types of innovation in the cable and wire manufacturing industry in Nigeria

Table 1 shows the prevalence of each type of innovation found within the Cable and Wire manufacturing sub-sector. The table was constructed using the proportion of firms that had non-zero innovation indices. It shows that not less than 60% of the firms had engaged in product, process, organisational and marketing innovations during the period, 2003–2006. On the average, 66% of the firms were innovation-active during the reference period. Over a decade ago, in a study of 50 engineering and agro-allied firms in Nigeria, Oyelaran-Oyeyinka et al (1996) reported 39.1% process innovation and 61% product innovation. Compared to an innovation prevalence of 52.7% found by Bala-Subrahmanya (2005a) in a study of small enterprises in the state of Karnataka, India, Nigerian SMEs appear to be doing better. However, it should be borne in mind that the result from India represents a single region while our result here characterises a set of firms from the same industry.

Ranking[3] of the figures in Table 1 reveals certain nuances. The prevalence of product innovations ranked average. This is probably due to the fact that the resource requirements to implement these types of changes might not be available to many of the firms. For instance, product innovations in the industry arise mostly through the substitution of rubber and plain poly-vinyl-chloride (PVC) insulators with new and advanced polymers of PVC and polyethylene (PE). The use of these new materials sometimes require changes in processes and modifications in machineries which some of the firms might not be able to afford. Nonetheless, the fact that a good number of the firms were capable of implementing this type of material substitution was reflected in the 60% occurrence of product innovation.

Table 1: Prevalence of Innovation in the Cable and Wire Manufacturing Industry in Nigeria (2003 - 2006)

Innovation Type	Prevalence of Innovation (%)*	Level of Prevalence**
Product	60	Medium
Process	80	Medium
Marketing	70	Medium
Organisational	90	High
Diffusion-based	30	Medium
Average prevalence	66	

*Figures represent the proportion of firms that had non-zero innovation indices.
**Rating Scale:

Mean of scale ($\overline{X}$) = 55

Standard deviation of scale (σ) = 30

High $\geq \overline{X} + \sigma$ (85 and above)

Medium = between 25 and 85

Low $\leq \overline{X} - \sigma$ (25 and below)

Table 2: Correlation between the Innovation Types

	1	2	3	4	5
ProdInn	-				
ProcInn	0.380				
OrgInn	0.201	0.068			
MarkInn	0.404	0.704*	0.293		

[3] see Begum, 2006 for details on ranking methodology. The basic approach is as presented below Table 1.

DiffInn	0.000	0.242	-0.150	0.000	-

*Correlation is significant at the 0.05 level (2-tailed); t= 2.804

Table 3: Summary of the Proxies for the Types of Innovation

Type of Innovation	Proportion of Firms	
Product innovation	Innovated	Started but later abandoned
Developed new product	40	-
Introduced new product	60	
Improved existing product	60	-
Process Innovation		
Introduced new process	60	-
Improved existing process	70	-
Marketing Innovation		
Introduced new marketing techniques	60	-
Developed new local market	30	10
Developed new foreign market	10	20
Organisational Innovation		
Changed management routine	50	10
Introduced Quality Control	10	7
Introduced new maintenance routine	80	-
Changed plant layout	40	50
Introduced new waste management procedures	10	50
Implemented in-house training	10	70
Diffusion-based Innovation		
Obtained product licence	30	-
Obtained process licence	30	-

The prevalence of organisational innovations was observed to be higher than that of all other innovation types. It was the only type of innovation that ranked high. This primarily suggests that organisational changes are at the heart of the innovation processes in the Cable and Wire manufacturing sub-sector. These changes, like OECD (2005) argued, are typically expressed in business practices and workplace organisation that are new to the firm and occur as a result of strategic management decisions. The intensive prevalence of organisational innovation, within our developing country context is not surprising because organisational changes, very much like process innovations, are less risky and consume much less resources compared to other types of innovations. Concerning process innovation, it has been noted that changes in processes are less rigid, more responsive to 'shop-floor' serendipitous discoveries and may not generally require financial investments as much as product innovations (Egbetokun *et al.,* 2009).

Table 1 further shows that the performance of the firms in diffusion-based innovation was relatively poor. It was the only innovation type where less than 50% of the firms had been active within the reference period. It is important to note here that

although purchase of new machinery/equipment is included in the concept of diffusion-based innovation, the index constructed eventually only included product and process licensing. This happened because most of the firms were reluctant to divulge information on their purchase of equipment. However, the information gathered from the interview pointed to the fact that most firms actually imported every piece of machinery as a whole but mastered their use and maintenance to the point that they can adapt local spare parts for use on these machineries. Furthermore, apart from the youngest firm in the sub-sector which was established in 2006 and the oldest one which invested in backward integration in 2007, almost none of the firms invested in embodied technologies (except spare parts which were mostly adapted from local sources) during the period covered by this study. This does not, however, imply that as far as the acquisition of embodied technology is concerned, the firms in the Cable and Wire manufacturing industry are entirely not dynamic. It should be noted that the machineries used in the industry are very expensive and the firms could have made their acquisitions outside the period that this study covered.

The 30% incidence of diffusion-based innovation recorded in Table 1 actually arose from product and process licences. This somewhat low figure is a true representation of the situation within the sub-sector. The firms in the industry are all SMEs that are mostly confronted by several resource constraints. It is therefore difficult for them to procure licences. Low levels of absorptive capacities may also explain this situation (Audretsch *et al.,* 2005; Rosa and Mohnen, 2008). The firms that have been able to do this included one which was part of a Europe-based corporation and one that was founded by the former Chief Executive of a government-owned cable manufacturing outfit which had international ties.

Finally on innovation types, Egbetokun *et al.* (2009), in an industry-wide study in Nigeria had earlier reported a correlation between product and process innovation. Rather than support that finding, this detailed sub sectoral study actually revealed a different paradigm. The figures in Table 2 suggest that process innovations might generally be accompanied by marketing innovations ($r = 0.704$; $t = 2.804$; $p<0.05$). This makes sense because firms make changes in their processes (which sometimes are due to new products), new or improved approaches to marketing may be required to guarantee, or at least improve the chances of success. It shows that within the same context, industries do behave differently as far as innovation is concerned.

4.3 Intensity of innovation in the cable and wire manufacturing industry

The evaluation of the intensity of innovation within the sub-sector was carried out by considering the breadth of innovation among the firms and the levels of investment in innovation. "Breadth" here refers to the extensiveness of the various innovative activities implemented by the firms during the reference period. OECD (2005) and UNU-INTECH (2004) identified a broad range of activities that a firm could undertake for it to innovate. Table 3 lists these activities as they were considered in this study. The more of these activities that a firm is posited to implement, the stronger the firm would be; and by extension, the broader the range of innovation within an industry, and the more dynamic the industry would be. For instance, a higher level of uncertainty and competitiveness is

very likely to be experienced within an industry where firms have comparable tendencies to develop new products, modify existing ones, make changes in their processes and approach the market in an innovative manner, among other innovative activities. This is opposite to what might be observed in an industry made up of very few firms that have cutting-edge ability to implement several innovation types and many others who can only make minor changes within a narrow spectrum of innovation. Within large markets such as is available in Nigeria, the latter category of firms will tend to be 'laggards' while the former category will reap substantial economic benefits. Consequently, it is not sufficient for a firm to just focus on a narrow range of innovation activities, even if that is where it gains the maximum competitive advantage. It is also crucial for the firm to develop capabilities for a broader range of innovations, for it is only then that it would be well posited to better withstand disruptions when they occur within the industry.

The descriptive statistics on the breadth of innovation within the Cable and Wire sub-sector are shown in Table 4. The innovation dynamism of the industry appears to be bounded between the upper extreme of organisational innovation (65.83%) and lower extreme of diffusion-based innovation (20%). Product, process and marketing innovation exist between these two extremes. Additionally, it was gathered in the interviews conducted that although most of the firms engaged in several innovation activities during the reference period, only a few of the firms actually engaged in a broad spectrum of innovation activities. This probably explains why most of the innovation breadth values are below the industry's aggregate (Table 4).

Taken together with the figures on the prevalence of innovation, a main implication of these is that the overall innovativeness in the Cable and Wire manufacturing industry in Nigeria is average and organisational innovations account for the highest portion of this innovativeness. This is explained by a number of factors. First, as earlier mentioned, resource constraints may be undermining the efforts of the firms in other types of innovation, particularly product and diffusion-based innovations. This is more evident in the low level of activity in these innovation types (Table 3). Secondly, the industry association, CAMAN constitutes a significant learning path. The association instituted a Technical Committee which monitors members' compliance with quality benchmarks. The Committee ensures that member firms conform to high product standards and adopt high-quality processes. To achieve these, firms need to implement more activities that amount to organisational innovations relative to the other innovation types (see Table 3).

Table 4: Descriptive Statistics on Breadth of Innovation in the Cable and Wire Manufacturing Industry in Nigeria (2003 - 2006)

Innovation Type	Maximum	Mean	SD	Breadth (%)
Product	6.0	3.2	2.9	53.33
Process	4.0	2.6	1.6	65.00
Marketing	6.0	2.3	1.9	38.33
Organisational	12.0	7.9	3.6	65.83
Diffusion-based	2.0	0.6	0.97	20.00
Aggregate*				53.55

*Aggregate refers to the breadth for all innovation types within the industry

Further empirical evaluation of the intensity of innovation was somewhat difficult to do at the sub-sectoral level because most of the firms were reluctant to supply precise financial information, particularly regarding their turnover. Data on machinery/equipment investment was not obtained from any of the firms and only 5 firms (among the largest in the industry) supplied estimates of staff training expenditure and turnover, although all of them claimed to have implemented staff training. The results presented in Table 5 show innovation intensity in terms of firms' staff training expenditure as a proportion of turnover during the reference period. This is perceived to be sufficiently indicative of innovation intensity when the critical role of staff training (and hence, organisational learning) in the build-up of innovation capability is considered (Romijn and Albaladejo, 2002; Bell, 1984; Goedhuys, 2007). In fact, innovation expenditure, including expenditure incurred for training and consultancy, has been regarded as one of the most commonly used indicators of innovation activity (University of Cambridge, 1992; Bala-Subrahmanya, 2005a); and firms can relatively easily quantify their spending on training and consultancy as well as equipment and testing but the reverse is the case for materials and labour, owing largely to lack of systematic records.

The firms spent an average of ₦0.361 million (about 206,000 USD) on the build-up of innovation capability through staff training during 2003-2006. For the 5 firms, staff training expenditure formed 0.114% of total turnover. The import of this is that for every million that a firm makes only ₦1, 140 (about 6.5 USD) is committed to the firm's innovation efforts through staff training. An innovation intensity of 0.0075% in a firm-level case study within the cable and wire sub-sector had earlier been reported (Egbetokun *et al.*, 2007). Compared to figures from elsewhere, these levels of investment in innovation are quite low. For instance, among Indian SMEs, Bala-Subrahmanya (2005a) found an innovation intensity of 0.79% in terms of innovation expenditure and about 10% in terms of labour. Notwithstanding, the organisational strength bestowed on the firms by CAMAN seems to make up for these deficiencies and has made the sub-sector highly economically significant

Table 5: Innovation Intensity in the Cable and Wire Manufacturing Industry in Nigeria (2003 - 2006)

Variable	Value	Average
Total Training Expenditure (million naira)	1.805	0.361
Total Turnover (million naira)	1590	318
Innovation Intensity (%)	0.114	-

5. Conclusions and Recommendations

We have explored the types and intensity of innovations in the typical SME in a developing country. Our study was situated within the context of the Cable and Wire manufacturing sub-sector. Although some product, process and marketing innovation with traces of diffusion-based innovation were found, organisational innovations were at the heart of the innovation activities of the firms. Process and marketing innovations were also established to be directly related. In addition, we have shown that each industry has its own innovation peculiarities, albeit inconclusively. Considering the resource

deficiency that the firms face, it is to be concluded from these that firms operating within such contexts are not necessarily innovation-inactive. However, they might not be able to engage in implementing product and process changes that require much knowledge and financial investments. Nonetheless, organisational changes that are not necessarily based on advanced investments are not beyond the reach of these firms.

The importance of firm-level investment in organisational learning is further brought to the fore by the findings. Firms are required to consciously make investments in developing a proficient stock of human capital. This study advances some new knowledge on the specific role that industry associations could play in facilitating firm-level innovativeness. Few earlier studies have identified such associations as important in the innovation performance of firms and the knowledge available on the specific roles that they are capable of playing is still very sparse. Obviously, the roles of industry associations now transcend mere activism and protection of rights to involve plugging resource deficiencies for member firms, helping member firms learn and creating access to innovation-friendly support.

Although data limitations might limit the extent to which the result of this study could be generalised, the emergence of clear patterns would allow for some policy suggestions. To enhance the innovation performance of domestic enterprises and ensure that this performance becomes more expressive, it is particularly important to:

i. encourage firms, especially the SMEs, by reducing financial resource constraints such as taxes and tariffs in a competitive manner. The pioneer status policy of government that exempts a pioneering firm from taxes for a specified period is particularly meaningful in this regard. But beyond that, for non-pioneers, tax reductions may be tied to innovation incentives such as backward integration, use of local alternative raw materials, indigenous ownership of firms etc.;
ii. support the development of domestic enterprises through government procurement. First, this guarantees a market for the firms which would then not have to worry about how to generate revenue. Secondly, if government accompanies this with a strong insistence on high quality and world-class standards, it creates a sufficient pull on the innovativeness of the domestic enterprises;
iii. facilitate the formation of stronger business and industry associations with focus on competitiveness and innovation, and
iv. address the challenge of infrastructural constraints as a matter of urgency. Firms would be well assisted if they have access to highly-subsidised functional public utilities.

For the firms, the following specific suggestions are useful for the build-up of innovation capability:

i. Although the industry association has already been very supportive, its effect could be more pronounced at the firm-level if the shop-floor visits of the technical committee were made more regular and, to some extent, impromptu. In a sense, this would discourage window-dressing among member firms.
ii. On their own, firms are required to improve their absorptive capacities by creating regular programmes for staff development, and making the necessary investments.

This study had used a sub-sectoral approach to the study of firm-level innovation. Although the findings are useful, they can only serve as indications of possibly broader directions because of the limitations in the sample size and the data. Studies that use more robust samples would, therefore, be very beneficial. In addition, it remains to be seen whether or not there is a consistent difference across different industries when innovation is being considered. Also, knowing what sources of information firms draw upon for innovation and how it impacts on performance will be useful. Finally, more detailed sub-sectoral studies like this one would facilitate comparison of results.

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