Innovation and Absorptive Capacity: An Empirical Study of Manufacturing SMEs in the Western Province of Sri Lanka

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Abstract

This research paper investigates the absorptive capacity of the manufacturing SMEs in the Western province of Sri Lanka. Present study attempts to understand application of the external linkages and information sources in the process of innovation by selected firms. A sample of 280 firms was selected using stratified random sampling from the data base of Enterprise Survey 2003 which was the only available sample frame at present. Survey based data collection method was used with the semi structured questionnaire developed aligning with standard innovation survey instruments. The survey was followed with a focus group discussion for the purpose of in depth understanding of the reality. Data was analyzed qualitatively employing descriptive and interpretive tools to draw the conclusion that the Manufacturing SMEs in the Western province of Sri Lanka do not extensively use external information sources and have not maintained sufficient links with other firms, knowledge sources and government institutions for bringing new knowledge into their innovation activities.

Keywords: Absorptive Capacity, Developing Countries, Innovation, SMEs

1. Introduction

The concept of absorptive capacity has been a topic for continuous discussionsince its introduction by Cohen and Levinthal (1989), resulting in the said area developinginto a sound and rich domain of research, especially in the resource constrained countries. Authors such as Szulanski (1996), Lane and Lubatkin (1998), Van den Bosch et al. (1999), Gupta and Govindarajan (2000), Lane et al. (2001), Nielsen (2001) and Tsai (2001) have contributed to build a sound definition for absorptive capacity. Accordingly, absorptive capacity is the ability or skill which enables to recognize and evaluate the potential of knowledge and assimilate it within the organization for the purpose of translating into commercial purposes (Minguela-Rata et al., 2012). This is a concept highly applicable in the resource constrained sectors such as SMEs (Small and medium-sized enterprises)in developing countries, where the possibility of creating new knowledge is low. SMEs are important players in thenational innovation system of any country with its degree of influence depending on the policy support provided by the governments (Frietsch, 2012).The role of SMEs in poor economies is crucial as they deal directly with economically weak customers and employees from poor communities. As in many other countries, SMEs in Sri Lanka employ a large number of people and contribute considerably to the GDP. According to the Report of the Ministry of Finance and Planning (2012) SMEs contributed to 30% of GDP, 20% of exports, 30% of the production value added in the manufacturing sector, and employed 35% of the total workforce. However, they show lower innovation activities than larger enterprises and attractmuch less attention in the face of global competition (Weerasinghe et al, 2013). Further, in general, the share of SMEs′ R&D expenditure and R&D engagement is low on average, and often R&D and innovation processes are not conducted formally and continuously (Stokes, 2003).

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Absorptive capacity is a term introduced to describe the ability of an organization to exploit new knowledge. More specifically, firms should pay attention tonot only generating new information, but also enhancing the firm's ability to assimilate and exploit existing information (Cohen and Levinthal, 1989). Absorptive capacity consists of a set of closely related skills, which identify and evaluate the potential of external knowledge in a particular domain, assimilate it within the organization, and apply it to commercial purposes Minguela-Rata (2012). Cowan et al. (2001) and Minbaeva et al. (2001) have also supported this definition for absorptive capacity through their definition of 'absorptive capacity' is a broader concept that includes 'ability and motivation to recognize the value of new knowledge, assimilate it and market it'. The different types of knowledge can be accessed and categorized into three segments i.e. the firm's own R&D, knowledge which originates with its competitors' R&D spill over and knowledge which originates outside the industry (Cohen and Levinthal, 1989). Engagement in own R&D supports to create new knowledge inside the organizations by wayof 'learning by doing'. The ideology of learning-by-doing is understood as an automatic process by which the firm becomes more practiced, and, hence, more efficient in doing what already has been done and will be provided fresh experiences . However, absorptive capacity in a firm to acquire outside knowledge already developed in the external environment will enable it to do something quite different (Cohen and Levinthal, 1989). Hence the absorptive capacity represents an important part of a firm's ability to create new knowledge. Some argue that this external knowledge is readily available free or at minimum cost or it is apublic good (Arrow, 1962 and Nelson, 1959). Perhaps it may not be the right opinion for every situation or firm. Therefore a firm needs considerable and sustainable financial allocation and human resources to enable to develop its absorptive capacity (Cohen and Levinthal, 1989). Accordingly, five external sources of knowledge have been identified by Cohen and Levinthal (1989). They are 1. upstream suppliers of raw materials, 2. upstream suppliers of equipments, 3. downstream users of the industry's products, 4. government agencies and research laboratories, and 5. universities. The impact of these factors on the firm's ability to learn and apply the knowledge obtained had been proven in their study empirically.

The absorptive capacity of an organization depends on several factors (Minguela-Rata et al., 2012). Amongst the different ideas, Cohen and Levinthal (1990) suggest that absorptive capacity depends on the structure of communication between the external environment and the organization. Van den Bosch et al. (1999) and Gupta and Govindarajan (2000) suggest that the level of knowledge that has been accumulated previously by the company and its relatedness to new knowledge is also an important determinant of absorptive capacity. Further, degree of association between the transmitter and the receiver is considered as a major determinant (Gupta and Govindarajan, 2000). It has been recognized that confidence, receiver familiarity with the new knowledge, the rules and values compatibility of both firms, and similarity of their dominant logics, the existence of certain structures and learning processes, strategic context in which knowledge will be used and ability to adapt knowledge to the strategic context also contribute for determining absorptive capacity (Lane et al, 2001). When different researchers focused on multiple elements, absorptive capacity seems to be based on the accessibility to different knowledge sources and the firm's intention to maintain a good relationship with knowledge sources to borrow the knowledge for their innovation. Accordingly, the present study investigates the degree of openness and the strength of the ties among the manufacturing SMEs in the Western province and the sources providing knowledge for their innovative activities. The role of the government institutions, universities, technology centers and research institutions require evaluation, together with studying the existing absorptive capacity of the selected SMEs. However this aspect and other determinants suggested in the literature will be addressed in the future studies, but not in the present paper.

2. Methodology

This is a survey type study designed to examine the innovative behavior of manufacturing SMEs in the Western province of Sri Lanka. The deductiveapproach of the study required a combination of descriptive and explanatory research designs. The operational population of the study consists of manufacturing SMEs in the Western province of Sri Lanka. The enterprise survey database (2003) maintained by the Department of Census and statistics of Sri Lanka was used as the sample frame of the study due to its wide coverage and reliability of data. The main reason for selecting the manufacturing sector was that SMEs account for 96 percent of the manufacturing sector in Sri Lanka (White Paper, 2002).

Further, the Western province, which includes threedistricts of the country (i.e. Colombo, Gampaha, and Kaluthara) were selected as it is the main commercial and administrative province of the country. The sample was restricted to 280 firms selected through the stratified random sampling method. The sample size for a large sample in a similar study conducted by the World Bank (2009) was 120, and it was justified with 7.5% precision and 90% confidence.

The samplewith 5 to 100 employees, according to the definitions of the Department of Small Industries and the World Bank Country Study in Sri Lanka for SMEs (Dassanayaka, 2009), was selected allowing a sufficient percentage for non-responses. Considering the contribution from the SME sector to the Gross Domestic Product, four leading industries were selected. They are namely; manufacturing of food products and beverages, manufacturing of textiles, manufacturing of wearing apparel, dressing and dying, and manufacturing of Rubber and plastic products (Department of Census and Statistics, 2010). The survey instrument to collect primary data was developed based on innovation surveys conducted by the European Union (CIS), African countries (NEPAD) and the National Science Foundation (NSF) in Sri Lanka. In the present study, data was collected through face to face interviewsbased on the structured questionnaire, spending around one hour per an interview. The survey was followed by a focus group discussion with 15 SME owners, for the purpose of identifying the barriers for innovation experienced by manufacturing SMEs.

Table 1: Manufacturing SMEsin the Western Province (in Four Selected Sectors)

Sector	Total Number of Firms	Added value to GDP (Rs.)
Manufacturing of food products and beverages	4407	140 Billion
Manufacturing of wearing apparel, designing and dying	1852	134 Billion
Manufacturing of rubber and plastic products	391	57 Billion
Manufacturing of textiles	2084	35 Billion

Source: DCS, Annual survey of industries, 2010

3. Results

As a result of personal involvement in collecting data through the interviewing mode, 145 completed questionnaires were collected. Out of completed questionnaires,fivewere removed from the analysis as the number of employees in those firms exceeded 200, showing the characteristics of large firms. As a result, data analyses were carried out based on 140 responses, which represents 50% of the originally designed sample. The number of firms engaged in manufacturing food products and beverages was recorded as 56 (40%), while 28 firms (20%) manufacturing wearing apparel, designing and dying were included in the analysis. Fifteen firms (10.7 %) and 20 firms (14.3%) were engaged in the two sectors -manufacturing rubber and plastic products, and manufacturing textiles respectively. The remainders (21 firms) wereundertakingtheir business in other related manufacturing industries such asmanufacturing wood products and furniture, and manufacturing food processing machinery and equipment. The main objective of the survey was to examine the absorptive capacity of the selected SMEs considering their formal linkages with other firms and actors of the national innovations systems (NIS) during the three-year period from 2009 to 2011. Data collected on innovative activities of the firms, information sources they used for innovation, formal linkages with other firms and institutions, resource allocation for innovation, and innovative output in terms of intellectual properties are presented herewith.

The SMEs' engagement in the four main innovative activities, namely, introducing new product(s)/service(s), improving existing product(s)/service(s), introducing new processes and improving existing processes, has been presented in Appendix 1. Accordingly, their involvement in innovative product and process development processes is considerable, ranging from 38.6 percent to 52.9 percent from the total observed firms. Even though this percentage is considerably high, it has been revealed that 95 percent of the innovative activities are new to the firm and there was little innovation in the category of 'New to the world' which will bring a new experience to the entire world.The latter probablymay be break-through innovations which may create a radical change in the whole society. Further, it was revealed that the results of these innovations havenot resulted in considerable financial gains to the firms. Instead, they could just survive in the competitionthey face through satisfying customer needs marginally with these incremental innovations. In addition to the above four main areas, innovations in the non-production areas related to management, operations, marketing and daily routines were discovered under different headings as summarized in Appendix 2.

Accordingly, many firms were not actively involved in the innovative activities in the above mentioned non-production areas of the organization. Most organizations still relied on traditional management, marketing, operations and daily routines instead of finding new and innovative cost effective solutions.

A few firms were engaged in management and marketing innovations in the selected industries, but many were stagnating at the same level and sometimes even found to be experiencing downturns due to poor marketing and management practices. Further, 57 respondents (40.7%) have found new markets in the home country, while just 14 firms have accessed foreign markets during the last three years. This indicates that many organizations still focus on traditional markets in the domestic area, rather than venturing out for more attractive new markets in the global arena. It was found that most of the organizations rarely appreciate external information sources(as per the percentages calculated based on the responses on information sources they used for innovation); the figures obtained were customers (37.1%) suppliers (21.4%), competitors (27.9%), consultancies from outside firms (16.5%), government ministries and programs (13.5%) , trade exhibitions and conferences (23.6%), business and industry associations (17.9%), universities and research institutes (10.7%), and technical, industry, or service standards (17.9%) for their innovative activities. Instead, they rely highly on internal data sources (the percentage of responses ranking them as of high importance was 54.2%), resulting in insufficient innovations with limited innovative capability. Barely around 10percentof the companies had good relationships with outside organizations such as consultancy firms, research institutes, universities and government institutions. However 29.2 percent of the respondents had formal relationships with their suppliers, 24.3 percent of organizations maintained linkages with clients or customers, while 16 per cent of the firms had linkages with their competitors and firms in the same industry. This was also a reason for their limited openness to innovation through knowledge spillovers from the places where new knowledge is generated (Appendix 3).

The survey revealed that a few organizations invested money in creating and acquiring new knowledge during the period of 2009-2011. As mentioned in Cohen and Levinthal (1989) clearly, it is compulsory to allocate a considerable amount of resourcesto R&D. Similarly technology transferring through purchasing new machinery and equipment, buying patents, paying for external consultancies also help to enhance absorptive capacity (Minguela-Rata, 2012). However manufacturing SMEs in the Western province have not aligned as required to enable them to acquire external knowledge for improvements. This is proven with the data from 136 respondents; only 19 organizations have acquired new machinery and equipment locally or from abroad. Merely14 organizations have allocated funds for in-house R&D activities and only 12 organizations spent money to acquire external knowledge such as purchasing patents, designs and paying for consultancies. Frequencies for other activities, such as acquisition of R&D knowledge, employee training, marketing innovations and organizational innovation are recorded as ranging from 7 to 10. In general, there was an insufficient allocation of funds for innovative activities as they believed that it is very difficult to recover these investments. As a result, they have engaged in low cost, mainly trial and error (incremental) methods, and low cost reverse engineering such as de-assembling old machinery and equipment, for improvement of their products and processes and obtaining technical know-how. It was found that many organizations indulged in low cost innovations in their production process improvements and have considerably extended the life time of some machinery with a 'mend and use approach'.

Further, machinery acquired by some firms had actually been ones removed from large companies due to being outdated, and sold out for old steel or scrap. SMEs have purchased such machinery, and, with or without minor repairs, used them for a further 10-15 years. Machinery and equipment used in many firms in the food and beverage industry are still low-tech and locally developed following the reverse engineering technique, since the final product (mainly bread) should be sold at controlled (by government) and affordable prices. The insufficient investment has causedpoor absorptive capacity when acquiring modern technology and the knowledge which has been already developed and applied in the world in the selected sectors and as a result correlated with the low level of innovation. Hence, a low level of innovative activities, limited knowledge access, and a low level of investment in innovation have influenced the poor innovative output revealed by a low number of patents, industrial design, copyrights and trade mark registrations. These were recorded at a very insignificant level, with the frequencies of 2, 3, 1, and 7 for the above four categories respectively, out of the 136 respondents. Finally, the study investigated the obstacles which suppress the innovative attempts of the manufacturing SMEs in the Western province of Sri Lanka.

According to the survey, factors such as the high cost of innovation, lack of internal and external funding sources, lack of skilled personnel, lack of information on technology and the poor economic condition of the country restricting the purchasing power of the people, act as the most relevant restraints on innovations. Focus group discussions conducted following the survey revealed that the affordability, as per the 4As model (Anderson and Billou, 2007) of the domestic market, is highly influential in making investment decisions for innovation.

The other three A's which influence investment considering enhancing the absorptive capacity of a firm (accessibility, awareness, acceptability) are not very critical in Sri Lanka, with it being a small country and having good infrastructure facilities such as transport, electricity and telecommunication. Affordability, customers littlewillingnessto pay for advanced innovations, has led to looking for low cost solutions. The other threat is customers' preference to accept low cost products which are provided by China and India. Those products are very cheap, but substandard, as the producers in India and China have a mass market of poor consumers seeking low cost products. They conveniently enter Sri Lanka with the linear trade policy and capture the poor customers in the country, thus posing a threat to emerging local SMEs who try to address the needs of poor communities. As a result the firms in Sri Lanka are reluctant to invest money to improve their absorptive capacity deciding that it is difficult to recover investment for innovation in the local low income markets. It was further discovered in the focus group discussions that the poor assistance extended by frontline officers of the government institutions and financial institutions is very much discouraging to the SMEs' innovative attempts. This limited encouragement from the frontline officers causes the insufficient resource allocations for improving their innovative capacity, even though government rules, regulations and policies are very supportive for these initiatives.

4. Discussion

This study argues that Sri Lanka is still a resource constrained country even though there are some positive trends after the ending of the 30 years of internal conflict. The domestic market continues to seek simple low cost solutions for day to day problems, with very limited and unstable purchasing ability. As Christensen (1997) clearly described, in an emerging market, which is resource constrained, consumers do not seek high quality but are conscious about price as many of them have only recently shifted from being non-consumers to consumers with little excess income. A similar situation prevails in Sri Lanka. As a result, the low quality- but very cheap in price- products from countries like India and China have a good market in Sri Lanka. Hence, the role of SMEs in Sri Lanka is crucial, but they are not well placed to meet the growth targets of facing the global challenges through innovations with enhanced innovative capacity. However, it is suggested that SMEs here should not limit themselves to the highly competitive and small domestic market, but instead that they need to reach the high value added market niches in the world by being innovative with the resources available in the country and improving their innovative capacity, rather than just exporting non-value added raw materials.

With the responses and the feedback obtained through focus group discussions, it can be concluded that the manufacturing SMEs in the Western province of Sri Lanka have the potential and enthusiasm to be innovative in products/services as well as be open to process introductions and improvements. Even though this is market driven and imposed by competition and vital for their survival, the key players in SMEs have recognized the importance of innovations, and those who have already got involved in innovations have shown very good performance. As Dutz and O'Connell (2013) clearly mentioned, the potentialities of the Sri Lankan firms are still underutilized. Hence, there is a good opportunity to encourage them to be more innovative in their products, services, processes and marketing, especially in addressing the requirements of the low income majority and thus resulting in the creation of good employment opportunities and contributing to the economic growth targets of the country. The survey revealed that the main barrier for effective innovations is that they are weak in internal knowledge creation processes as well as lack of sufficient linkages with government institutions, R&D firms, universities and funding organizations for accessing new external knowledge, information and funds needed for investments. As a result neither internal knowledge nor external knowledge was applied and they show very weak absorptive capacity. There is no rationality in blaming SMEs for this weakness as they are undergoing a struggle to survive under global competitive pressure and adverse environmental factors. Therefore, the need to move the relevant government institutions, R&D firms and universities closer to the SMEs, with more dynamic people moving out of their traditional boundaries to create fruitful linkages with this sector, which is weak in the sense of innovation, but important due to its significant contribution to the economic development, should be recognized.

Intermediaries such as technology centers, business development centers and incubators (Galli and Tuebal, 1997; Intarakumnerd and Virasa, 2002) may be some forms of opening up mechanisms to SMEs for triggering their innovations; through knowledge spillovers are needed as yet these are almost non-existent. The availability of financial institutions and their spreading to all communities is appreciated but there is a problem with the role and the attitudes of the people in the frontline.

Respondents in SMEs have shown their apprehension with frontline officers with regard to their incompetence, poor innovative orientation and having neither real intention nor practical knowledge to provide an effective service. This sector needs a more practical mechanism to implement government decisions and policies more realistically while being context-sensitive. Protection of domestic producers with foreign trade policies, support to find out the marketplaces in the global market, providing common innovative infrastructure facilities, assistance and closeness of the universities and research firms are also among the expectations of SMEs for triggering their actions towards innovation. Further, they are now suffering from the problem of finding new and skilled labor for their industries, as many young people with fresh knowledge obtained from technical colleges and universities prefer to find foreign employment with high salaries or to join large firms with prestigious namesrather than working in SMEs. Therefore, recruiting new and young employees, which is directly linked to the absorptive capacity of a firm, is a difficult task for emerging SMEs. This foreign employment policy has caused to increase labor cost too. SMEs expect government intervention to resolve this issue, through revising foreign employment policies rather than simply promoting the migration of physical labor for lower level jobs in other countries. Another very important implication found through the survey is the poor involvement in the knowledge creation and protection by the SMEs. Dutz and O'Connell (2013) also agree that there is insufficient knowledge creation by the private sector in Sri Lanka. SMEs should get more involved in the process of research and development for improvement of products, services, processes and markets. Academics and research workers are responsible for identifying their needs and collaborating with them to find solutions which have good commercial value. These firms are not strong enough to invest a lot of money in research and development activities, but are ready to purchase commercial research outcomes. However, many of them are not well-informed or progressive enough to discuss their issues with formal bodies like traditional universities and research institutions. As a remedy, knowledge workers need to transcend the traditional and formal ways of research, go to the firms' door step and pay attention to their issues,, study what is happening at the grass root level and find sensible solutions. All the actors of the innovation system are responsible for building a culture which promotes open communication and knowledge sharing while showing true commitment for effective innovations. Knowledge protection is also a crucial factor in encouraging firms to engage in their capacity enhancement towards innovation. There should be simplified procedures that can be understood easily, and a very close and friendly environment should be maintained in the relevant government institutions to create confidence in the legal processes involved.

5. Conclusion

The findings of the study support to arrive at policy implications towards promoting innovative capacity of SMEs through external linkages, resource allocations, assistance of different actors of the innovation system, and needed policy adjustments. It was found that the innovative activities in developing and improving products/services and processes are moderate but satisfactory, as by nature innovativeness is not a characteristic of all SMEs. Their marketing, organizational and managerial activities have been found to be insufficiently innovative. As a result, there is a need for sufficient knowledge, information infrastructure and assistance to be provided by the government, universities, technical education firms, and R&D institutions towards enhancing the innovative capacity in the sector. Further, there should be a mechanism to stay closer to SMEs through intermediation and friendly liaison officers as SMEs are not capable enough to chase new knowledge. It is important to bring external knowledge to SMEs seeking opportunities to collaborate with other firms, universities, technical centers and R&D firms to acquire newknowledge and share information about new products/ services, technology and markets. These actions are considered urgent and crucial for developing the absorptive capacity of the organizations which will be conducive to fruitful innovation which in turn will contribute to the economic development of the country. Further, this study emphasizes the need for supportive policies in foreign trade and foreign employment to promote SMEs to invest in capacity building, protectingthem from global competition to enable SMEs to find new knowledge through competent personnel.

Financial assistance from the banking system and government projects will help resource constrained SMEs to trigger innovations as they lack the resources to allocate the required funds by themselves to invest in developing absorptive capacity. The current study did not focus on the previous cumulative knowledge, which is the other most important determinant of a firm's absorptive capacity, and which leads to firm-level innovations. Further, the role of the customer as a buyer who can influence the firms' absorptive capacity has not been assessed. Moreover, this study did not address the innovation infrastructure and facilities provided by government institutions, universities, technology centers, R&D firms etc, which help the firms to build their absorptive capacity.

Studying the existing government policies related to capacity building of SMEs towards innovations is also important for building absorptive capacity of a firm. It is recommended that future researches in this field investigate these areas for improving innovative performance of SMEs and, thus, their positive contribution towards national economic targets.

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Appendix 01: Innovative Activities Recorded in the Firms

Response		New Products/Services		Improved Products/Services		New Processes		Improved Processes	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Yes	62	44.3	74	52.9	54	38.6	68	48.6
	No	76	54.3	63	45.0	84	60.0	69	49.3
	Total	138	98.6	137	97.9	138	98.6	137	97.9
Missing		2	1.4	2	1.4	2	1.4	3	2.1
Total		140	100.0	140	100.0	140	100.0	140	100.0

Source: Survey Data, 2013

Appendix 02: Other Innovative Activities

Response		Changes in Management		Change in Routines		Change in production location, layout etc.		Innovations in Marketing	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	Yes	33	23.6	37	26.4	53	37.9	34	24.3
	No	105	75.0	101	72.1	85	60.7	103	73.6
	Total	138	98.6	138	98.6	138	98.6	137	97.9
Missing		2	1.4	2	1.4	2	1.4	3	2.1
Total		140	100.0	140	100.0	140	100.0	140	100.0

Source: Survey Data, 2013

Appendix 03: Number of SME's that have formal linkages with other firms

Formal links with	Number of firms	Percentage (%)
Associated companies within the group	24	16.7
Clients or customers	35	24.3
Suppliers	42	29.2
Competitors	23	16.0
Consultancy and marketing firms	19	13.2
Private research institutes	12	8.3
Public research institutes	13	9.0
Universities	13	9.0
Government ministries and institutions	5	3.5

Source: Survey data, 2013