

Sources of Knowledge for Innovation in Automotive Component Manufacturing in South Africa, China and India

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Abstract--This paper investigates to which extent the scope and degree of novelty of innovation by automotive component manufacturers in developing countries is associated with the scope of sources of knowledge used. The literature indicates a positive association between these parameters in the developed country context. However, it is not evident that in the developing country environment the same associations exist. Potential causes include market composition and institutional conditions. The data was obtained from a questionnaire survey amongst automotive component manufacturers in South Africa, China and India. Some 500 responses were analyzed by association testing. For firms in South Africa no association was found between the diversity of sources of knowledge and diversity of impact of innovation. In the case of the firms in China the association was found for local and domestic sources of knowledge. In the case of firms in India, an association was found for local sources of knowledge. While in the case of South Africa the lack of association between the diversity of sources of knowledge related to local, domestic and international sources and innovation degree of novelty appear anomalous, it has to be understood within an institutional context that favors dependency on multinational parent companies rather than indigenous technological innovation based on accessing a broad range of sources of knowledge.

I. INTRODUCTION

Knowledge is of key importance for innovation that leads to competitive advantage [35]. Sources of knowledge can be internal, e.g. existing employees, or external, e.g. suppliers, clients, universities, government, even competitors. These could be local, in the domestic economy or international. Innovation can be defined as “doing something new such as a product, process or service, including newness in a firm. Innovation may refer to incremental, radical, and revolutionary changes in thinking, technologies, products, processes, markets or organizations.” [9]. Once again the scope could be local or extend to the domestic economy or be international.

The automotive manufacturing industry contributes a major portion of international manufacturing activity and trade by value. Governments in many developing countries pursue policies aimed at capturing part of the economic benefit resulting from vehicle and component manufacture for their local economies. Automotive component manufacturing offers better opportunities for creating employment, often a primary policy objective, than vehicle manufacture. This is because vehicle assembly has grown to be increasingly automated to meet the exacting competition amidst ever-increasing customer expectations of quality.

Automotive component manufacturers in developing countries are subject to potential constraints in sources of knowledge compared to their counterparts in developed countries due to by the nature of the local and domestic knowledge base. One option is to diversify their sources of knowledge and/or pursue sources beyond those locally available.

The objective of this study was to explore how automotive component manufacturers in selected developing countries diversify their sources of knowledge and how that is associated with a broader scope and level of novelty of innovation. This was approached by way of comparative analysis between the selected countries, as the implications for policy in the least developed country in learning from firm performance in the more advanced countries was of interest.

II. LITERATURE

A. Innovation

Innovation is normally defined as a tool ‘system’ program or created or purchased service of an organization which is new for the firm [38], [12]. From this perspective, the knowledge source for innovation can originate from both inside and outside the innovating entity.

B. Sources of knowledge in innovation

Reference [19] recommended a then rapidly emergent model of R&D that uses internal and external research organizations to generate a variety of technology options. They pointed out that the advantage often goes to the companies that are more adept at choosing among the vast number of technological options and not necessarily to the companies that create them. By way of example, it was found that Procter & Gamble corporate research and development used several core networks that were set to seek out new ideas. Procter & Gamble had technology entrepreneurs that created external networks by meeting with universities and industry researchers and by forming supplier networks [18].

Reference [28] studied data collected from 476 manufacturing firms and found that collaboration with non-suppliers including research institutions and universities is directly related to firms’ innovations. Global (international including regional) innovation networks are used for many purposes including but not limited to speeding up innovation, complementing existing research within the firm, compensating for limited resources within the firm, outsourcing easy routine tasks and tasks that are complex and occasionally required [10]. The link with external networks is

particular important in a developing country context and allows the firm to access knowledge that is not available to the firm [29], [10]. Reference [5] indicated that South African firms that have direct access to their overseas parent companies are strategically better positioned to be globally competitive since such firms have access to the developed global networks of the parent firm. Reference [1] concluded that in Canadian manufacturing firms, innovation was promoted by the use of large variety of sources of information and wide range of research sources.

C. Innovation and firm performance

The work done by [16] on effects of innovation types on firm performance in the Turkish manufacturing industry indicated that all innovations performed in manufacturing firms have significant and positive impact on firm performance. Reference [28] found that there is a positive link between firms' innovation and financial performance. They pointed out that this was consistent with findings from previous studies by [21], [27]. They also found that linkages with global national suppliers resulted in product innovations. Reference [3] reviewed the South African automotive component industry and reported performance rating criteria as viewed by customers of automotive component manufacturers in different markets. Customers rated quality, price, delivery reliability and conformance to standards in order of importance as the top four most important performance indicators they look for in products. Reference [17] explored the location aspects of the Chinese automobile industry and indicated that the locations in relation to suppliers, R&D internal and external capacity, regional clusters of the automobile industry and information networks can be used to enhance competitive strategy. Reference [23] reported on firms from India and China operating in the automotive component, software and green-biotech industries in a complement to the study of this paper. They found that the availability of well qualified human resources helped to strengthen cost and differentiation strategy to access markets. Reference [20] found that in the Irish high-technology sector some external sources increases the likelihood of product and process innovation, relations with the supply chain have a positive association with innovation and relations with competitors have no notable influence on innovation. Reference [26] indicated that association with competitors had a negative influence on innovation in the Spanish manufacturing industry. Reference [20] also found that association with education institutions had a negative effect on innovation, but this finding contradicted previous studies [24], [26].

D. Sources of knowledge and innovation degree of novelty

While innovation as a topic has been widely researched [36] and [13], few studies have been done on the degree of novelty of innovations. Reference [26] analyzed the data from Spanish manufacturing firms and found that degree of novelty increased in association with suppliers, clients, and research in this order. Reference [26] indicated that their

findings were similar to other European studies with the exception of their finding that in Spain collaboration with competitors negatively affected innovation. Reference [25] found that in Canadian manufacturing firms, novelty of innovation increased with firms that had stronger linkages with government laboratories and universities, R&D and collaborative arrangements. This is consistent with the finding by [24] that alliance with public organizations and universities influenced product innovation in East Asian manufacturing firms.

Reference [29] found that a broader network of technology and knowledge which extends beyond regional or local sources positively affects innovations new to the domestic market and new to the world. They concluded that firms with global sources of technology and knowledge have a higher degree of innovation.

Reference [15] reviewed trends in the global automotive manufacturing industry focusing in developing countries. He studied the shift from west to east in terms of both production and consumption. According to [15] the shift is primary due to foreign direct investment into developing countries as a result of emerging economies offering large and growing markets with low labour cost.

E. Open innovation

Reference [11] defines open innovation as: "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively". Reference [14] proposed an open innovation concept which is represented in Figure 1. This is similar open innovation frame works proposed by different researchers such as [19], [32], [11]. The basis of the open innovation framework is that a firm sources knowledge from internal and external sources and uses it to generate innovations.

F. Conclusion on theory review

In the reviewed literature it is indicated that sources of knowledge increases innovation in the firm. However the degree of novelty of innovation is influenced by the type of collaborative sources used by the firm. The collaborative sources available to the firm are dependent on the region and the policies of the country/region in which the firm operates. Therefore the reviewed literature has to be contextualized for the automotive component industry. The South African automotive component industry still needs to be investigated and understood regarding how the available and utilized sources of knowledge relate to the degree of innovation novelty. Reference [39] described the manufacturing industry as "fraught with a higher degree of uncertainty, where firms must be alert to the need to innovate or perish". It is generally accepted that knowledge is key to the process of innovation [37]; however the issue of the sources of knowledge in their contribution to innovation has not received much attention in research on the developing country automotive components industry.

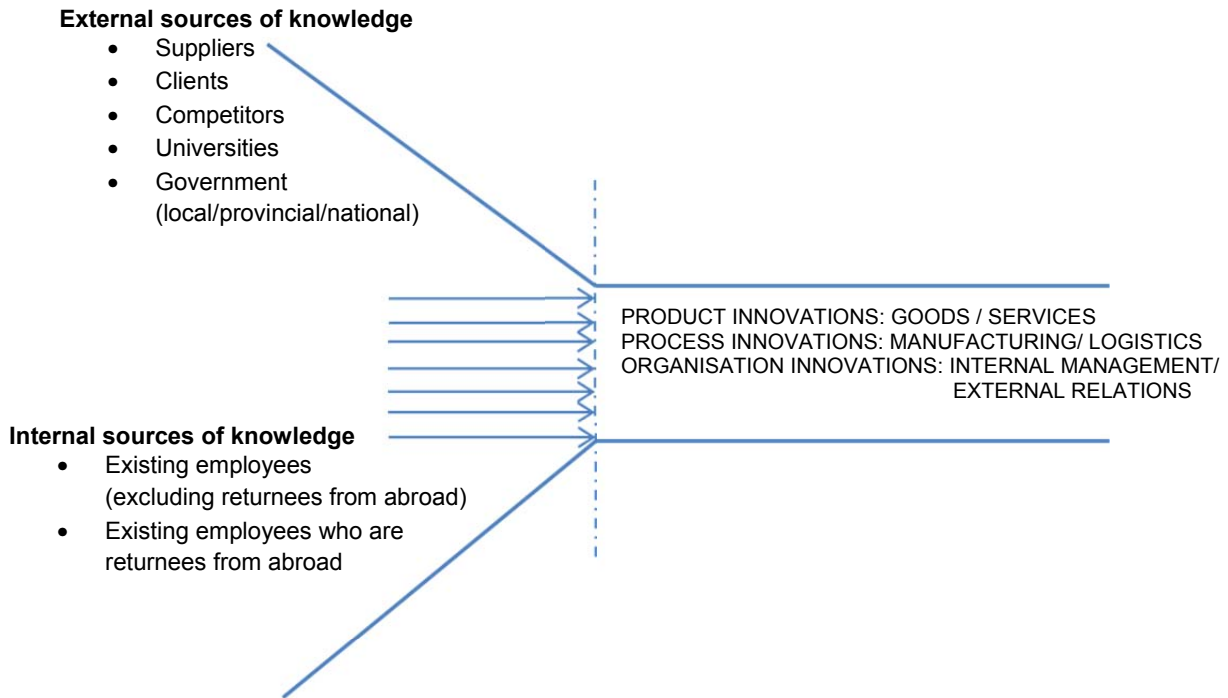


Figure 1 : Open innovation model (Adapted from [14], [19])

III. RESEARCH METHODOLOGY

A. Framework

In order to explore how automotive component manufacturers in selected developing countries diversify their sources of knowledge and how that is associated with a broader scope and level of novelty of innovation, the following research questions were posed:

- Is diversity of sources of knowledge associated with diversity of innovation impact?
- Is diversity of sources of knowledge associated with innovations with significant impact?
- Is diversity of sources of knowledge associated with innovation degree of novelty?

Corresponding hypotheses and null hypotheses were derived as indicated later in the reporting on the results.

Innovation was categorized as relating to product, process or organization as follows:

- Product innovation is the market introduction of new goods (P1) or services (P2) or a significantly improved good or service.
- Process innovation is the implementation of a new or significantly improved production process (PR1), or distribution method or support activity for the firm's good or services (PR2).
- Organizational innovation is the implementation of new business practices in the firm's procedures, new knowledge management systems or new methods of workplace organization. These can be internal to the firm

(O1), or with external firms or with public institutions (O2).

The innovation could be developed internally or by other firms. The degree of novelty of the innovation was categorized as new to the firm, new to the domestic market or new to the world. The areas of impact on strategy achievement of the innovation were categorized as quality, cost reduction, delivery time improvements and new products and services.

Sources of knowledge were categorized as existing employees (excluding returnees from abroad), existing employees who are returnees from abroad, suppliers, clients, competitors, consultancy companies, universities and government. The level of the latter six could be at local, domestic or international level. Knowledge was indicated to include technology.

B. Methodology

A questionnaire survey was employed. As the research was aimed at discovering new ideas or patterns (exploratory research) a survey questionnaire was deemed appropriate method to generate the required data as it provides both qualitative and quantitative information that can be analyzed to provide the required detail to the results.

This was applied in the context of three newly developed or developing countries, i.e. the Beijing region in China, the Pune region in India and South Africa, thus spanning a range of level of development and industrial development policy. Workshops including advisors from academia, industry and government were used to calibrate the questions for the

different country contexts. The survey was conducted in 2008 and 2009, targeting performance in 2007. The questionnaires were completed by managers representing the firms.

The level of diversity of a variable was established by the count for items indicated as applicable for that variable. By way of example, the diversity scores for question 4 attached in Appendix A were created by adding the items that each respondent marked. The diversity values for innovation impact on main strategy could range from 0 – 4, this means that the diversity score for innovation impact could have a minimum of 0 (no diversity) and a maximum of 4 (if all 4 categories were ticked). Similarly in question 1 attached in appendix A the diversity level of sources of knowledge was from 0 - 8 depending on the number of sources used by each respondent. In all questions considered counts of 0 or 1 were categorized as not diverse, while counts of 2 or more were categorized as diverse.

In the Beijing region in China the number of respondents was 190 which comprised a response rate of 32%, in the Pune region in India 273 comprising a response rate of 54% and in South Africa 75, comprising a response rate of 39%. The total number of responses of 538 and the average response rate of 42% exceeds the requirement for a 90% confidence level as targeted for an exploratory study.

As indicated previously, comparative analysis was conducted, with particular focus on possible learning for policy from firm performance in South Africa when compared to that of firms in the two more advanced countries.

C. Country contexts

As context had been found to influence choices on sourcing of knowledge, the contexts of the economies studied require further detailing.

In the 1980's China introduced a policy aimed at obtaining advanced technology through joint ventures and other forms of co-operation while opening its domestic market to multinational companies. While its domestic market has been dominated by foreign brands for a long time and the few domestic brands have been largely unable to compete with foreign brands, China has not only become the world's largest auto market, but also the world's largest car producer. Domestic brands have already gained a domestic market share exceeding 30% [40]. Beijing is considered to be the scientific and technological heart of China with a large number of highly regarded universities and research institutions. It is renowned for technology transfer from universities to industry [30].

Indian automotive component manufacturers are becoming major actors in the highly developed supply chain of the motor industry. With the arrival of international motor manufacturers, domestic manufacturers, faced with intense competition, have responded by upgrading productivity and quality [34]. Competition has become so intense that firms are being increasingly innovative in order to reduce costs, improve quality and performance [33]. Also, with increasing

demand from the government for fuel efficiency and pollution control [2] the pressure to innovate has been increasing. Although Indian automotive component manufacturers still contribute relatively little new to the world innovation, their growth in innovative performance over the last decade has increased dramatically. According to the OECD (Organisation for Economic Co-operation and Development) of 2008 in [23], the internationalization of India has increased significantly with India transitioning towards an “interdependent innovator”.

In the Pune region of India there are several multinational automotive OEMs (original equipment manufacturers) such as Volkswagen, Mercedes-Benz and General Motors with headquarters in industrialized countries, but also OEMs with headquarters in India, such as Tata Motors, Mahindra and even Bajaj Auto, one of the largest motorcycle manufacturers in the world. The India based OEMs design and develop vehicles primarily for emerging economy markets. The diversity of OEM origins in the Pune region creates a more diversified market for automotive components than in South Africa. This creates the potential more diverse knowledge sourcing and types and degrees of novelty of innovation.

The automotive component manufacturing industry in South Africa experienced extensive transition to global ownership since 1997 when the new government took advantage of the favorable change in international attitude to South Africa to introduce export-driven policies. As trade barriers fell, South Africa, as with many other developing countries, faced a new competitive environment which included the need to enter external markets whilst coping with new entrants in the domestic market. With increasing competition, South African component manufacturers needed to upgrade to defend their position in the global value chain [22]. The industry is strongly influenced by multinational OEMs manufacturing vehicles in South Africa [4]. Because of export-directed policies, OEM subsidiaries in South Africa are integrated much more extensively into the global strategies of their parent companies [4] than in India. Because of this, automotive component manufacturers in South Africa produce components for vehicles that are designed and developed primarily for industrialized economy markets. These component manufacturers have increasingly becoming adapters of knowledge because of the standardization of global designs [7]. A decade after the announcement of the policy changes that supported the transition, [22] could observe that several automotive component suppliers in South Africa had designed and manufactured innovative products while most upgraded technological capabilities or at least attained execution competence.

According to [31], the South African vehicle manufacturing production grew from 389 392 vehicles per year in 1995 to 532 545 vehicles per year in 2011 which is about 40% growth since 1995. During the same period China vehicle manufacturing production grew from 1 435 000 to 18 418 876 vehicles per year and India vehicle production grew from 636 000 to 3 940 360 vehicles per year. The vehicle

production growth in China and India was 1184% and 520% respectively from 1995 to 2011. The South African vehicle production growth is far lower than both China and India. According to [6] the size of South Africa's domestic market and its regional location constitutes a clear disadvantage in regard to attracting international investment. However, as the largest automotive manufacturing hub in Africa it would appear to have potential for growth in an environment of rapid economic growth in many of the countries in the sub-Saharan region of Africa and beyond.

IV. RESULTS

A. Demographical results

1) Firm ownership

The first part of the analysis covered company ownership. It was found that 20% of South African firms were single plant firms while in China and India 77% and 56% of firms respectively resorted in this category. An enterprise firm was described as a group that consists of two or more legally defined enterprises under common ownership. Each enterprise in the group may serve different markets, as with national or regional subsidiaries, or serve different product markets. The head office is also part of an enterprise group. From Figure 2, it can be concluded that most (80%) of the South African firms are part of an enterprise group while less than 50% of the firms in China and India were part of an enterprise group. Reference [8] indicated that about half of the South African firms were foreign owned, this being firms where 50% or more of the ownership is from foreign investors, typically multinational parent companies.

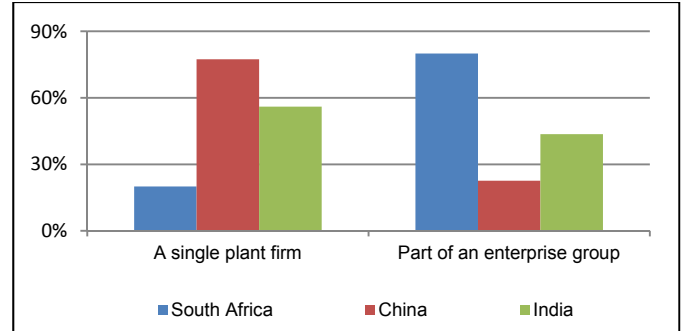


Figure 2: Firm ownership

2) Types of Innovations by Country

The firms were asked to indicate the innovations they had introduced in 2007 under the categories as defined below and in Appendix A. The responses were as indicated in Figure 3.

- NEWGOODS (P1) The unit introduced new or significantly improved goods
- NEWSERV (P2) The unit introduced new or significantly improved services
- NEWMANF (PR1) The unit introduced new or significantly improved methods of manufacturing
- NEWLOG (PR2) The unit introduced new or significantly improved logistics
- NEWIMP (O1) The unit introduced new or significantly improved internal management practices
- NEWOER (O2) The unit introduced new or significantly improved methods of organizing external relations

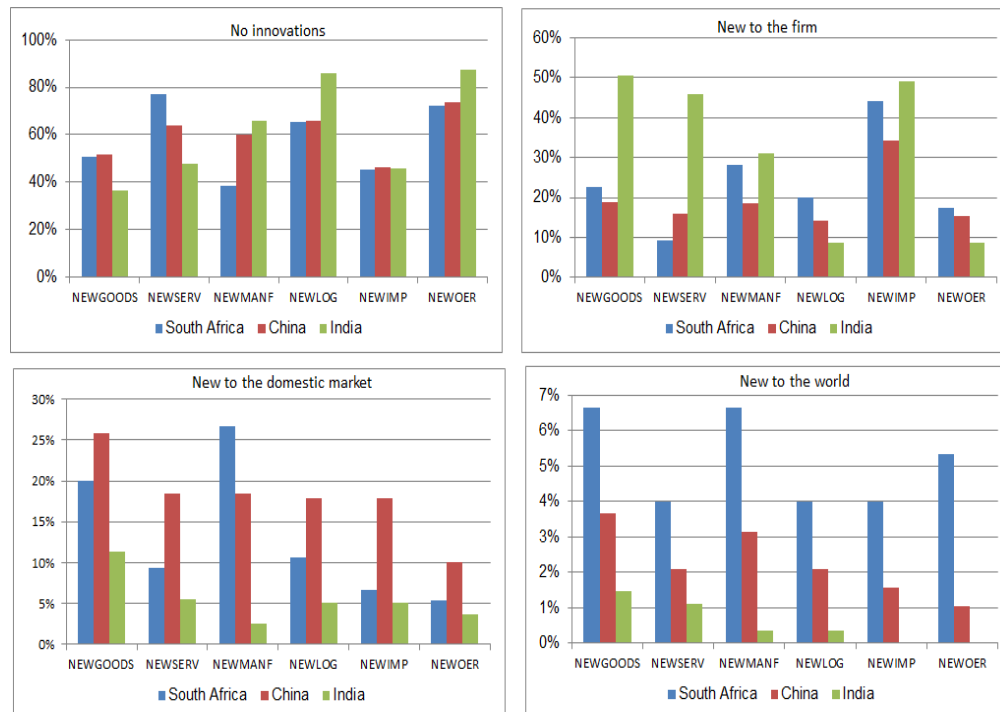


Figure 3 : Types of innovations by country

The levels of innovations new to the world relative to total innovations performed by the firms were small, as follows:

- South African firms - between 4% and 6.7%,
- Chinese firms - between 1.1% and 3.7%,
- Indian firms - between 0% and 1.5%.

The level of innovation in the category of new to the world was less than 10% in all countries. This finding corresponds to the work done by [29], where firms in developing countries were found to focus on innovations new to the firm and rarely have new to the world innovations.

3) Strategy to access international markets

This study showed that South African firms use all innovation strategies to access domestic markets. These strategies comprised quality, cost reduction, delivery time improvements and new products and services. Similarly in China and India all four strategies were used to access international markets. This finding was similar to that of [23] that companies in China and India used hybrid or complex strategies to access international markets. The percentage of total sales for the firms from South Africa, China and India destined for domestic markets were 66%, 87% and 95% respectively. Firms from China and India could thrive on a low percentage of international sales probably due to their large domestic markets. Therefore the need to access international markets is lower for firms in China and India in comparison to firms in South Africa. It was found that there is no association between quality strategy to access international markets and country; this indicates that quality is used as a qualifying capability in all three countries to access international markets. These findings are similar to those of [3] where customers rated quality, price, delivery and conformance to standard as most important indicators required in products.

B. Hypothesis Testing Results

1) **H₀₁: There is no association between diversity of sources of knowledge and diversity of innovation impact.**

Chi-square testing was performed to evaluate if there is an association between diversity of sources of knowledge and the diversity of innovation impact. The results are presented in Table 1.

The results indicate no association between diversity of sources of knowledge and diversity of innovation impact for South Africa firms in all origins of sources of knowledge i.e. local, domestic and international. Reference [5] indicated that

South African firms that have direct access to their parent firms are strategically better placed to be globally competitive. Reference [7] indicated that foreign ownership brings new technologies and easier access to knowledge or expertise. This study suggests that South African firms use non-diversified sources of knowledge, obtaining knowledge primarily from their parent international firms. As indicated above some 50% of the South African firms studied were part of an international enterprise group [8].

In China, it was found that there were associations between diversity of local and domestic sources of knowledge and diversity of innovation impact. No association was found when sources of technology were international. This finding suggests that the firms in the Beijing region of China could obtain their required knowledge mostly from local and domestic sources.

In India an association was found between diversity of local sources of knowledge and diversity of innovation impact while no associations were found for domestic and international sources of technology. It indicates that the extensive industrialization and knowledge infrastructure in the Pune region of India provides a sufficient resource base.

2) **H₀₂: There is no association between diversity of sources of knowledge and innovations with significant impact.**

The firms were asked to indicate which type of innovation in terms of product, process or organisational had the most significant impact in the firm performance. South African firms had the least product innovation with a significant impact compared to firms in China and India. Firms in India had almost 30% more product innovation than those in South Africa and China firms. South African automotive component manufacturers indicated that process innovation had the most impact in terms of firm performance as shown in Figure 4. The firms from China and India focused more on product innovation while firms from South Africa focused more on process innovation. The Chi-square test indicated that there is significant difference between the innovation that had the most significant impact and the country with a p-value<0.0001. It confirms that innovations in the automotive component industry and their contributions are dependent on the region or country. This indicates a need for the South African government to understand innovation in the context of South Africa in order to try and increase vehicle production at comparable rates to those in China and India.

TABLE 1 : CHI-SQUARE TEST P-VALUES FOR DIVERSITY OF SOURCES OF KNOWLEDGE AND DIVERSITY OF INNOVATION IMPACT

Origin of diverse sources of technology and knowledge	Diversity of innovation impact					
	South Africa		China		India	
	Pearson Chi-Square	Comment on Hypothesis	Pearson Square	Chi-Comment on Hypothesis	Pearson Chi-Square	Comment on Hypothesis
Local	0.762	Cannot reject H ₀₁	0.024*	Reject H₀₁	0.045*	Reject H₀₁
Domestic	0.168	Cannot reject H ₀₁	0.005*	Reject H₀₁	0.072	Cannot reject H ₀₁
International	0.727	Cannot reject H ₀₁	0.74	Cannot reject H ₀₁	0.469	Cannot reject H ₀₁

* Significant at 5% level

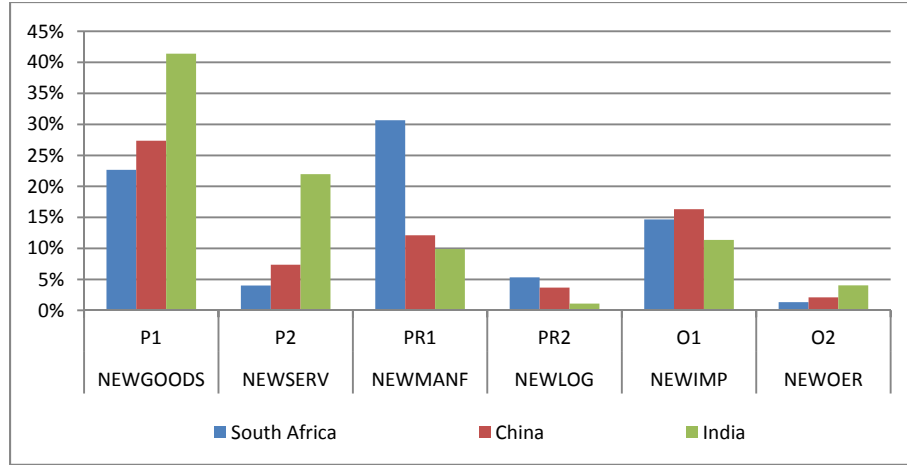


Figure 4 : Innovation with most significant impact

The null hypothesis, H_{02} : "There is no association between diversity of sources of knowledge and innovations with significant impact" could not be rejected. The findings indicate no association between diversity of sources of knowledge and innovations with significant impact on firm performance for firms from all three countries. This finding differs from the reviewed literature [19], [11], [20], [14], [32] which suggested that opening a firm to diverse sources of knowledge results in innovations. The difference could be ascribed to the more constrained knowledge resource environments experienced by firms in developing countries.

3) H_{03} : There is no association between diversity of sources of knowledge and innovation degree of novelty

For firms from South Africa the results indicate that there is no association between diversity of sources of knowledge and innovations "new to the world", "new to the domestic

market" and "new to the firm" utilizing sources of knowledge of local origin, domestic origin or international origin. The null hypothesis, H_{03} : "There is no association between diversity of sources of knowledge and innovation degree of novelty" could not be rejected for South African firms. Such lack of associations similar to South African firms were also found in firms from China except for the case of "new to the firm" innovations and sources of technology originating from the local market where null hypothesis H_{03} could be rejected. Firms in India showed an association only for domestic sources of knowledge in "new to the firm" or "new to the domestic market" innovations, where the null hypothesis H_{03} could be rejected. In the case of China and India the findings are in agreement with findings by [26], [24], [25], for their primary market contexts while those for South Africa were not. This is ascribed to the limited diversity of sources of knowledge in the case of South African firms.

TABLE 2: P-VALUES FOR DIVERSITY OF SOURCES OF KNOWLEDGE AND INNOVATION DEGREE OF NOVELTY

Country	Origin of sources of knowledge	Degree of novelty of innovation					
		New to the world		New to the firm		New to the domestic market	
		Fisher's Exact Test	Comment on H_{03}	Fisher's Exact Test	Comment on H_{03}	Fisher's Exact Test	Comment on H_{03}
South Africa	Local	1.000	Cannot reject H_{03}	0.900	Cannot reject H_{03}	0.371	Cannot reject H_{03}
	Domestic	1.000	Cannot reject H_{03}	0.650	Cannot reject H_{03}	1.000	Cannot reject H_{03}
	International	1.000	Cannot reject H_{03}	0.650	Cannot reject H_{03}	1.000	Cannot reject H_{03}
China	Local	0.500	Cannot reject H_{03}	0.009*	Reject H_{03}	0.773	Cannot reject H_{03}
	Domestic	0.486	Cannot reject H_{03}	0.749	Cannot reject H_{03}	0.154	Cannot reject H_{03}
	International	0.286	Cannot reject H_{03}	0.353	Cannot reject H_{03}	0.412	Cannot reject H_{03}
India	Local	1.000	Cannot reject H_{03}	0.688	Cannot reject H_{03}	0.063	Cannot reject H_{03}
	Domestic	1.000	Cannot reject H_{03}	0.011*	Reject H_{03}	0.037*	Reject H_{03}
	International	N/A	N/A	0.053	Cannot reject H_{03}	0.444	Cannot reject H_{03}

N/A: India did not have diverse sources and the chi square statistic could not be calculated.

* Significant at 5% level

V. CONCLUSIONS AND RECOMMENDATIONS

As pointed out by [19]: "The advantage now often goes to the companies that are more adept at choosing among the vast number of technological options and not necessarily to the companies that create them". References [29], [10] indicated that linkages with external networks are particularly important in developing countries and allow firms to access knowledge that is not available to them. South African automotive component manufacturing firms are under constant pressure to apply new strategies to enable them to be competitive in the global markets. The literature reviewed [19], [29], [11], [14], [32], [6] indicates that linkages with external sources increase innovation and firm performance. While in the case of South Africa the lack of association between the diversity of sources of knowledge related to local, domestic and international sources and innovation degree of novelty appear anomalous, it has to be understood within an institutional context that favors dependency on multinational parent companies rather than indigenous technological innovation based on accessing a broad range of sources of knowledge. This study also indicates that innovation strategy outcome differs by country and cannot be easily generalized. The results from South Africa indicate greater dependency on multinational parent companies. It is recommended that government policies to provide incentives for R&D are to be directed at reducing this dependency. The disadvantage of location and small size of the South African domestic market plays affected knowledge and innovation strategy selection by South African firms. If they were to target the growth potential of a growing African market they would need to adopt knowledge sourcing practices employed by firms in China and India. Further analysis is recommended to rank the diverse sources of knowledge in terms of influence on innovation impact and degree of novelty.

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APPENDIX A

Extract from Questionnaire for Automotive Component Manufacturer Innovation

1. Were the following sources of technology and knowledge important for your product/process innovation? If not, leave the rows blank. If yes, please indicate with a cross whether the sources were mainly local, domestic or international (Mark one/column – max 8)	Local	Domestic	International
Existing employees (not returnees from abroad)			
Existing employees (returnees from abroad)			
Suppliers			
Clients			
Competitors			
Consultancy companies			
Universities			
Government			

2. Did your unit introduce any of the following innovations? If you did not, leave the rows blank. If you did, please put a cross under one of the three columns indicating the degree of novelty. (Mark one/column – max 6)			New to		
			World	Domestic Market	Firm
Product	P1	Goods			
	P2	Services			
Process	PR1	Manufacturing Methods			
	PR2	Logistics			
Organizational	O1	Internal Management			
	O2	External Relations			

3. Which one of the product/process/organizational innovations selected in the previous question had the **most significant impact** in terms of sales/export etc. on your unit performance? (Please indicate the code P1, P2.....)

4. Please indicate if this innovation had an impact on your main strategies to access international or domestic markets. (Mark all that apply – max 4)	
Quality of products/services	
Cost of products/services	
Delivery time	
New products/services	